DOCUMENT RESUME

ED 479 274 SP 041 689

TITLE	Recommended Feeding and Dietary Practices To Improve Infant and Maternal Nutrition.
INSTITUTION	Academy for Educational Development, Washington, DC.
SPONS AGENCY	Agency for International Development (IDCA), Washington, DC. Office of Nutrition.
PUB DATE	1999-12-00
NOTE	39p.; Published by LINKAGES (Breastfeeding, Complementary Feeding, and Maternal Nutrition Program). Support provided by the USAID Bureau for Global Programs, Field Support and Research, Office of Health and Nutrition (G/PHN/HN).
CONTRACT	HRN-A-00-97-00007-00
AVAILABLE FROM	LINKAGES Project, Academy for Educational Development, 1825 Connecticut Avenue, N.W., Washington, DC 20009. Tel: 202-884-8000; Fax: 202-884-8977; e-mail: linkages@aed.org; Web site: http://www.linkagesproject.org. For full text: http://www.linkagesproject.org/media/publications/ Technical%20Reports/recfeeding.pdf.
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	EDRS Price MF01/PC02 Plus Postage.
DESCRIPTORS	Adolescents; *Breastfeeding; Child Development; *Dietetics; Females; Health Behavior; *Infant Care; *Nutrition; Prenatal Care

ABSTRACT

The LINKAGES Project is intended to improve breastfeeding and related complementary feeding and maternal dietary practices. The project, in consultation with technical experts and program managers, identified a set of recommended feeding and dietary practices intended to break the cycle of poor health and nutrition that passes from generation to generation. This booklet presents the technical justification for the recommendations, focusing on: a summary of recommended feeding and dietary practices for infants age 0-6 months (e.g., initiate breastfeeding within about 1 hour of birth, establish good breastfeeding skills, and breastfeed exclusively); breastfed children age 6-24 months (continue frequent, on-demand breastfeeding to 24 months and beyond, introduce complementary food around age 6 months, increase food quantity as the child ages while maintaining frequent breastfeeding, practice active feeding, and practice good hygiene and proper food handling); and adolescent girls (age 10-19 years) and women of reproductive age (e.g., increase food intake as needed, diversify the diet to improve quality and micronutrient intake, use iodized salt, and allow adequate tie between the cessation of lactation and the next pregnancy to replace and build up energy and micronutrient reserves). (SM)

Reproductions supplied by EDRS are the best that can be made
from the original document.

SP SPTR D235

ED 479 274

Recommended Feeding and Dietary Practices to Improve Infant and Maternal Nutrition

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

E. Dole

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

LINKAGES

Improving nutrition and reproductive health

2

BEST COPY AVAILABLE

SP04/689

Recommended Feeding and Dietary Practices to Improve Infant and Maternal Nutrition

February 1999

Recommended Feeding and Dietary Practices to Improve Infant and Maternal Nutrition is a publication of the LINKAGES (Breastfeeding, Complementary Feeding, and Maternal Nutrition Program) Project. LINKAGES is supported by the G/PHN/HN, Global, U.S. Agency for International Development, under Cooperative Agreement No. HRN-A-00-97-00007-00 and managed by the Academy for Educational Development. The opinions expressed herein are those of the author(s) and do not necessarily reflect the views of the U.S. Agency for International Development.

The LINKAGES Project
Academy for Educational Development
1825 Connecticut Avenue NW
Washington, DC 20009
Tel: 202-884-8000
Fax: 202-884-8977
E-mail: linkages@aed.org

First Printing, March 1999
Second Printing, December 1999

Table of Contents

Acknowledgments v

Executive Summary vii

Introduction 1

I. Recommended Feeding Practices to Improve the Nutrition of Infants 0 to 6 Months 3

II. Recommended Feeding Practices to Improve the Nutrition of Children 6 to 24 Months 6

III. Recommended Dietary Practices to Improve the Nutrition of Adolescent Girls and Women of Reproductive Age 15

Conclusion 24

Summary of Recommended Readings 25

References 25

Acknowledgments

This paper benefitted from the contributions and advice of many individuals. Sandra Huffman and Luann Martin were major contributors. Special thanks are extended to Jay Ross for his insightful comments, to Roy Miller for presentation of DHS data, and to Ellen Piwoz of the SARA Project for her contribution to the section on complementary feeding. LINKAGES and AED staff who participated in review meetings and provided comments on draft documents included Jean Baker, Rolando Figueroa, Mary Lung'aho, Peggy Parlato, Maryanne Stone-Jiménez, Vicky Quinn, and Victor Aguayo. Other individuals who contributed to this document are Stephanie Gabela from Wellstart International who provided helpful comments on an earlier draft, Erika Lutz for examples of diets for children and pregnant women, Soe Lin Post for graphics, and Kimberly Ferguson and Cindy Arciaga Lauer for layout. The support, technical advice, review, and constructive feedback on various drafts by Susan Anthony, Mihira Karra, Miriam Labbok, and Shelley Snyder are greatly appreciated.

Executive Summary

Malnutrition can start before birth and can persist throughout life. Many babies are born with low birth weight and micronutrient deficiencies. Poor feeding practices during the first two years of life have immediate and often long-term negative consequences on growth and development. Nutritional stress during adolescence and the reproductive years affects the health of women and, consequently, the next generation. This paper identifies a set of recommended feeding and dietary practices to break this cycle of poor health and nutrition that passes from generation to generation. It also provides the scientific evidence to support the recommendations.

Exclusive breastfeeding for about six months ensures that the young infant receives maximum health and nutritional benefits from breastmilk. Exclusively breastfed infants are at a much lower risk of infection from diarrhea and acute respiratory infections than non-breastfed infants. When other foods or fluids are consumed, there is an increased risk of exposing the young infant to pathogens that cause sickness, leading to decreased nutrient intake and death.

Children are at greatest risk of nutritional deficiency and growth retardation between the age of 6 and 24 months. Around six months of age, introduction of complementary foods, along with sustained breastfeeding, is required. Appropriate complementary feeding helps promote growth, prevent stunting, and increase a child's chances for a healthy, productive life as an adult. Improving complementary feeding requires a combination of strategies. Energy intake can be increased by breastfeeding more frequently, feeding complementary foods more often, providing energy-dense foods, practicing active feeding, and increasing food portion sizes. If locally available foods are inadequate, micronutrient supplementation may be needed.

Another period of nutritional stress is adolescence and the reproductive years. Additional energy is needed to support adolescent growth, fetal growth during pregnancy, and milk production during lactation. While pregnancy represents an important opportunity for health and nutrition interventions, nutritional problems must also be addressed at other times in a woman's life. Adequate energy and micronutrient intake is critical at all stages. For adolescents and women of reproductive age, improved energy intake, a diversified diet, and increased micronutrient intake through food fortification can help to improve their health and nutrition, as well as birth outcomes. When appropriate foods are not available, micronutrient supplements can improve nutritional status.

The recommendations presented in this paper and listed on the following pages focus on feeding and dietary practices and not on other important determinants of nutritional status such as household food security, health services, and environmental factors. They are grouped into several categories: children 0 to 6 months, children 6 to 24 months, and adolescent girls and women of reproductive age. The goal is for healthy women to give birth to healthy babies who receive optimal nutrition, first through their mothers' breastmilk and then, from around 6 months to 24 months and beyond, through breastmilk and appropriate complementary foods.

These recommendations can serve as guidelines for program planners and policymakers to use in setting policies and designing communication, service delivery, and training activities. LINKAGES suggests that program planners collaborate with communication specialists in determining how to present this advice in a culturally appropriate way to different groups that influence feeding and dietary practices. Local assessments will help determine the emphasis to give each practice. LINKAGES also recommends that program planners collaborate with local nutrition specialists to "translate" caloric requirements into local foods and measurements.

BEST COPY AVAILABLE

Summary of Recommended Feeding and Dietary Practices

Infants 0 to 6 Months

- **Initiate breastfeeding within about one hour of birth.**
- **Establish good breastfeeding skills (good positioning and attachment).**
  - Baby should be held close to mother, facing the breast, with the baby's ear, shoulder, and hip in a straight line.
  - Infant's mouth should open wide just before attaching so the nipple, and as much of the areola as possible, are in the mouth. If properly attached, the lips are rolled outward, with the tongue over the lower gum.
  - Signs of effective feeding include visible jaw movement drawing milk out, rhythmical suckling with an audible swallow, and no drawing in of cheeks.
- **Breastfeed exclusively** (no prelacteal feeds, no other foods, no water or other liquids) for about the first six months.
- **Practice frequent, on-demand feeding, including night feeds** (8–12 breastfeeds per 24 hours, every 2–3 hours, or more frequently if needed).
- **In areas where vitamin A deficiency occurs, mothers should take a high-dose vitamin A supplement (200,000 IU) as soon as possible after delivery, but no later than eight weeks postpartum, to ensure adequate vitamin A content in breastmilk.**

Breastfed Children 6 to 24 Months

- **Continue frequent, on-demand breastfeeding, to 24 months and beyond.**
- **Introduce complementary foods beginning around six months of age.**
  - Breastfeed before each feeding of complementary food.
- **Increase food quantity as the child ages while maintaining frequent breastfeeding.**
  - Provide 6- to 8-month-old infants *approximately* 280 kcal per day from complementary foods.
  - Provide 9- to 11-month-old infants *approximately* 450 kcal per day from complementary foods.
  - Provide 12- to 24-month-old children *approximately* 750 kcal per day from complementary foods.
- **Increase complementary feeding frequency as the child ages, using a combination of meals and snacks.**
  - Feed complementary foods to 6- to 8-month-old infants 2–3 times per day.
  - Feed complementary foods to 9- to 11-month-old infants 3–4 times per day.
  - Feed complementary foods to 12- to 24-month-old children 4–5 times per day.

Summary of Recommended Feeding and Dietary Practices

Breastfed Children 6 to 24 Months (con't.)

- **Gradually increase food thickness and add variety as the child ages, adapting the diet to the child's requirements and abilities.**
  - Feed mashed and semi-solid foods to infants, starting around 6 months of age.
  - Feed energy-dense combinations of foods to 6- to 11-month-olds.
  - Introduce "finger foods" (snacks that can be eaten by children alone) at about 8 months of age.
  - Make the transition to the family diet at about 12 months of age.

- **Diversify the diet of both the breastfeeding mother and the child by including fruits, vegetables, fortified foods, and/or animal products to improve quality.**
  - Feed fruits and vegetables daily, especially those rich in vitamin A and other vitamins.
  - Feed meat, poultry, fish, or other animal products daily or as often as possible (if feasible and acceptable).
  - Use fortified foods, such as iodized salt, vitamin A-enriched sugar, iron-enriched flour, or other staples, when available.
  - Give vitamin-mineral supplements when animal products and/or fortified foods are not available.

- **Practice active feeding.**
  - Feed infants directly and assist older children when they feed themselves.
  - Offer favorite foods and encourage children to eat when they lose interest or have depressed appetites.
  - If children refuse many foods, experiment with different food combinations, tastes, textures, and methods for encouragement.
  - Talk to children during feeding.
  - Feed slowly and patiently and minimize distractions during meals.
  - Do not force children to eat.

- **Practice frequent and active feeding during and after illness.**
  - During illness, increase fluid intake by more frequent breastfeeding, and patiently encourage children to eat favorite foods.
  - After illness, breastfeed and give food more often than usual, and encourage children to eat more food at each sitting.

- **Practice good hygiene and proper food handling.**
  - Wash caregivers' and children's hands before food preparation and eating.
  - Keep all food preparation surfaces clean; use clean utensils to prepare and serve foods.
  - Cook food thoroughly.
  - Avoid contact between raw foodstuffs and cooked foods.
  - Serve foods immediately after preparation; avoid storing cooked food.
  - Wash fruits and vegetables.
  - Use safe water.
  - Use clean cups and bowls; never use feeding bottles.
  - Protect foods from insects, rodents, and other animals.
  - Store non-perishable foodstuffs in a safe place (separate from pesticides, disinfecting agents, or other toxic chemicals).

Summary of Recommended Feeding and Dietary Practices

Adolescent girls (10–19 Years) and Women of Reproductive Age

Recommended at all times

- Increase food intake, if underweight, to protect adolescent girls' and women's health and establish reserves for pregnancy and lactation.
- Diversify the diet to improve the quality and micronutrient intake.
  - Increase daily consumption of fruits and vegetables.
  - Consume animal products, if feasible and acceptable.
  - Use fortified foods, such as vitamin A-enriched sugar and other products and iron-enriched and vitamin-enriched flour or other staples, when available.
- Use iodized salt.
- If micronutrient requirements cannot be met through available food sources, supplements containing iron, vitamin A, zinc, and other nutrients may be needed to build stores and improve women's nutritional status.

Recommended during periods of special needs:

At certain times, girls and women have heightened nutritional requirements. During these times, they should follow the above recommendations *plus* those listed below.

During adolescence (between 10 and 19 years of age)

- Increase food intake to accommodate the adolescent "growth spurt" and to establish energy reserves for pregnancy and lactation.

During pregnancy

- Increase food intake to support fetal growth and future lactation.
- Take iron/folic acid tablets daily.

During lactation

- Eat the equivalent of an extra meal per day.
- In high-risk areas, take a high dose vitamin A capsule (200,000 IU) as soon after delivery as possible, but no later than 8 weeks postpartum, to build stores, improve breastmilk quality and reduce maternal morbidity.

During the interval between the cessation of lactation and the next pregnancy

- Allow adequate time (at least six months) between the cessation of lactation and the next pregnancy to replace and build up energy and micronutrient reserves.

Introduction

The overall objective of the LINKAGES Project is to improve breastfeeding and related complementary feeding and maternal dietary practices. The Project cuts across traditional boundaries between health/nutrition and population programs, emphasizing the overlapping benefits of four health-related practices: optimal breastfeeding, timely introduction of family planning, including the Lactational Amenorrhea Method (LAM), timely and appropriate complementary feeding, and better maternal nutrition.

Together, these practices contribute to fertility reduction, improved reproductive health, and child survival. Listed below are examples of the overlapping benefits of the four health-related practices.

- A well-nourished mother provides optimal nutrition to her fetus and is less likely to give birth to a premature infant or to a low birth weight, full-term baby. She is also able to provide optimal nutrition to her exclusively breastfed infant.
- The Lactational Amenorrhea Method (LAM) and improved breastfeeding practices extend birth spacing.
- Optimal breastfeeding and complementary feeding behaviors promote health, growth, and development and increase a child's chances for a healthy, productive life as an adult.
- Good feeding practices during the first two years greatly reduce the risk that a girl will reach maturity stunted and at risk of obstetric complications and the delivery of a low birth weight baby.

The LINKAGES Project, in consultation with technical experts and program managers, identified a set of recommended feeding and dietary practices to improve nutritional status at various points in the life cycle: birth to about six months, six months to 24 months, and adolescence and the reproductive years. This paper presents the technical justification for the recommendations. Policymakers and program planners can use them as guidelines for developing messages and programs appropriate to prevailing local conditions.

When viewed within a larger conceptual framework (Figure 1), LINKAGES' recommendations are part of maternal and child care, one of three major underlying determinants of nutritional status. Feeding practices affect both dietary intake and health status, which are the immediate determinants of nutritional status. The impact of LINKAGES' activities on improving feeding and dietary practices will be greater if they are supported by determinants of nutritional status that are outside LINKAGES' scope of work. These determinants include household food security, health services, environmental factors, and other care issues such as physical workloads. A few examples illustrate the importance of food security, health services, reduced physical workloads, and family planning.

- *Access to food*: Poor-quality diets may be due to poverty, the unavailability of nutrient-rich foods, and inequitable distribution of food within a household.
- *Access to preventive and curative health services*:
  - Hookworm infection contributes to anemia and anorexia.
  - Malaria tends to worsen nutritional status by destroying red blood cells, resulting in anemia.
  - Illness often suppresses appetite and predisposes children to malnutrition. For example, diarrhea causes decreased nutrient absorption and decreased dietary intake.
- *Reduced physical workloads*: Heavy physical labor and high levels of energy expenditure that are not compensated for by increased food intake undermine nutritional status. In a study in Ethiopia, the caloric intakes of pregnant women participating in high and low levels of physical activity were compared. Both groups consumed approximately the same number of calories. Women who engaged in low levels of physical activity gained, on average, nearly three kilograms more than women involved in heavy labor. Their infants weighed

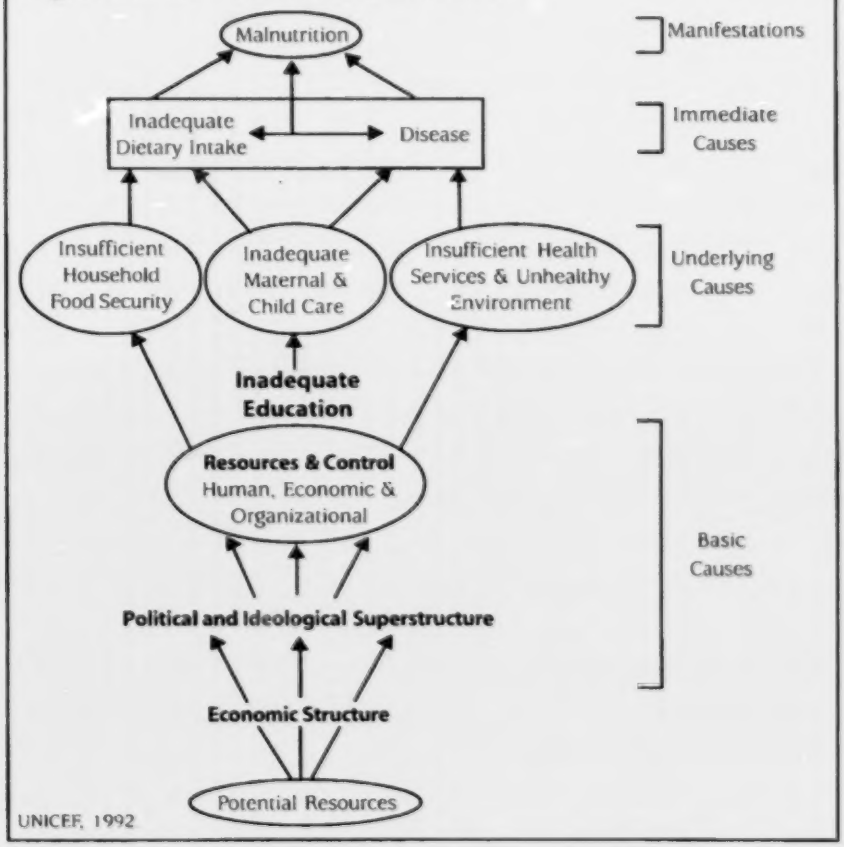
about 200 grams more than the other group (Tafari et al., 1980).

- *Delay of first pregnancy*: Teenage pregnancy increases the risk that a baby will be born with low birth weight. In a study in urban areas of Mali and Burkina Faso, teen mothers were almost twice as likely to give birth to low birth weight babies as older mothers (LeGrand and Mbacké, 1993).
- *Birth spacing*: Frequent childbearing increases a woman's risk of malnutrition because of the nutritional demands of pregnancy and lactation. Extended birth intervals also benefit the child. A child born less than two years after the previous child is two times more likely to die before the age of five than a child born after an interval of two years or more (Hobcraft, 1991).

The remainder of this paper focuses on feeding and dietary practices as underlying determinants of nutritional status. The paper does not address issues surrounding infant feeding and HIV/AIDS. These issues are discussed in a separate LINKAGES publication, *Frequently Asked Questions on Breastfeeding and HIV/AIDS*. For a discussion of interventions to promote and support LINKAGES' recommended practices, the reader is referred to two papers developed for LINKAGES:

- *Improving breastfeeding behaviors: Evidence from two decades of intervention research* (Green, Forthcoming) and
- *Interventions to improve complementary food intakes of 6–12 month old infants in developing countries: What have we been able to accomplish?* (Caulfield, 1998).

Figure 1. Causes of Malnutrition



I. Recommended Feeding Practices to Improve the Nutrition of Infants 0 to 6 Months

The benefits of breastfeeding for infant health and survival, child growth and development, and maternal health are well documented. These benefits are summarized in a LINKAGES publication, *Quantifying the Benefits of Breastfeeding: An Annotated Bibliography* (Lutter, 1998). This chapter discusses six key practices, listed in Box 1, that support optimal nutrition during the first six months of life. Exclusive breastfeeding, with frequent, on-demand feedings, also contributes to child spacing and lower total fertility rates. A woman who is amenorrheic, less than six months postpartum, and fully or nearly fully breastfeeding[1] is more than 98 percent protected against pregnancy, as demonstrated in clinical trials of the effectiveness of the Lactational Amenorrhea Method (LAM) for birth spacing (Labbok et al., 1997).

Initiate breastfeeding within about one hour of birth

The first step to optimal breastfeeding is to put the baby to the breast within the first hour of birth. Initiation during the first hour takes advantage of the newborn's intense suckling reflex and alert state (Righard, 1990). Early initiation also stimulates breastmilk production; fosters mother-child bonding; and immediately provides the infant the enhanced anti-bacterial, anti-viral, and nutritional properties of colostrum (the first milk).

Establish good breastfeeding skills (proper positioning and attachment)

A key factor to initiating successful breastfeeding is the establishment of good breastfeeding skills during the first days. Proper positioning and attachment increase the infant's suckling efficiency, facilitating effective removal of milk from the breast, adequate milk intake, and the production of breastmilk. Proper positioning and latch-on also reduce friction on the mother's nipples that can cause pain and result in sore or cracked nipples (Shrago and Bocar, 1990).

Signs of proper positioning and attachment include:

- Baby should be held close to mother, facing the breast, with the baby's ear, shoulder, and hip in a straight line.
- Infant's mouth should open wide just before attaching so the nipple, and as much of the areola as possible, are in the mouth. Once attached, the lips should be rolled outward, with the tongue over the lower gum.
- Signs of effective feeding are: visible jaw movement drawing milk out, rhythmical suckling with an audible swallow, and no drawing in of cheeks.

Suckling at the breast differs from sucking from a bottle. Use of a bottle to feed expressed breastmilk can result in

Note 1
Full or nearly full breastfeeding includes exclusive breastfeeding, "almost exclusive" (vitamins, mineral water, juice, or ritualistic feeds given infrequently in addition to breastfeeds), and "high" levels of breastfeeding (the vast majority of feeds are breastfeeds). Intervals should not exceed four hours during the day and six hours at night. Supplementation should represent no more than 5–15 percent of all feeding episodes. (Labbok et al., 1994)

Box 1. Recommended Feeding Practices to Improve the Nutrition of Infants 0 to 6 Months

- Initiate breastfeeding within about one hour of birth.
- Establish good breastfeeding skills (proper positioning and attachment).
- Breastfeed exclusively (no prelacteal feeds, no other foods, no water or other liquids) for about the first six months.
- Practice frequent, on-demand feeding, including night feeds (8–12 breastfeeds per 24 hours, every 2–3 hours, or more frequently if needed).
- In areas where vitamin A deficiency occurs, mothers should take a high-dose vitamin A supplement (200,000 IU) as soon as possible after delivery, but no later than eight weeks postpartum, to ensure adequate vitamin A content in breastmilk.

less effective suckling at the breast, "nipple confusion," the introduction of pathogens through unsterile feeding bottles, and, in the most extreme cases, refusal of the breast (Newman, 1990). To avoid these problems, expressed breastmilk should be fed by cup.

Pacifiers (dummies) and other artificial teats can also interfere with breastfeeding and serve as a vehicle for contaminants. One study in Brazil reported that the proportion of children who were no longer breastfed at six months of age was significantly higher among babies who used pacifiers at one month of age than among those who did not use pacifiers (Victora et al., 1993).

Breastfeed exclusively (no prelacteal feeds[2], no other foods, no water or other liquids) for about the first six months

A randomized trial conducted in Honduras suggests that babies who are exclusively breastfed for six months grow as well as those who receive complementary foods from the age of four months (Cohen et al., 1994). Given the risks of infection due to food-borne pathogens, most experts now recommend exclusive breastfeeding for about the first six months. Exclusive breastfeeding ensures that the young infant receives the maximum health and nutritional benefits from breastmilk. A study (Duncan et al., 1993) in Tucson, Arizona, of more than 1,000 babies found that babies who were exclusively breastfed for four months or more had 40 percent fewer episodes of acute ear infections than breastfed babies who received other foods before four months.

There is also clear evidence that the exclusively breastfed child is at a much lower risk of infection from diarrhea and acute respiratory infections than infants who receive other foods (Brown et al., 1998; Popkin et al., 1990; Lutter, 1997). For example, in the Philippines, the risk of diarrhea among infants four months of age who received complementary foods was 6–13 times greater than for exclusively breastfed infants (Popkin et al., 1990). Even the addition of water or other non-nutritive liquids doubled the risk of diarrhea compared with exclusively breastfed infants.

Water supplementation is both unnecessary and dangerous because it can introduce contaminants and reduce nutrient intake. In India use of non-nutritive liquids was associated with a decline in breastmilk consumption (Sachdev et al., 1991). Six studies that examined the water requirements of exclusively breastfed infants in diverse climates reported that healthy infants who consumed enough breastmilk to meet their energy needs also satisfied their fluid requirements, even in hot and dry climates (WHO, 1991). The studies were conducted in Argentina, Israel, India, Jamaica, and Peru.

Practice frequent, on-demand feedings, including night feeds (8–12 breastfeeds per 24 hours, every 2–3 hours, or more frequently if needed)

Frequent feedings increase breastmilk production and maintain supply. They help to prevent problems, such as breast engorgement, that might discourage a woman from breastfeeding. Newborns who are breastfed on demand generally regain their birth weight sooner than those fed on a schedule (de Carvalho et al., 1983). Indicators of infant hunger are increased alertness, mouthing, and rooting for the nipple. Crying is a late sign of hunger (Anderson, 1989).

Some babies, such as passive, sleepy babies, may seldom cry or "demand" to be fed. Mothers should be informed that for optimal nutrition, babies need to be breastfed 8–12 times per 24 hours, every 2–3 hours, or more frequently as needed during the first months. During the first few days after birth, many babies breastfeed more frequently and often for longer periods than when breastfeeding is fully established.

Note 2
Prelacteal feeds include water, other liquids, or ritual foods given to a baby before breastfeeding is initiated.

In areas where vitamin A deficiency occurs, mothers should take a high-dose vitamin A supplement (200,000 IU) as soon as possible after delivery, but no later than eight weeks postpartum, to ensure adequate vitamin A content in breastmilk

The concentration of vitamin A in breastmilk depends on a woman's vitamin A status and the changing needs of her growing infant. Preterm milk is higher in vitamin A concentration than term milk. During the first two weeks of lactation, the vitamin A concentration in breastmilk is nearly double the concentration at one month. The mature breastmilk of women with relatively good maternal health and nutritional status provides enough vitamin A for at least the first six months and possibly the first year (Newman, 1993).

In areas where vitamin A deficiency is endemic, women may have low vitamin A concentration in their breastmilk, increasing a child's risk of becoming clinically deficient during illness. Preterm infants are at particular risk of vitamin A deficiency because they have virtually no reserves of retinol in their livers (Greene, 1991). Providing a high-dose vitamin A supplement to the *mothers* of at-risk infants soon after delivery will improve their vitamin A status and, in turn, the vitamin A content of their milk. In a study in Bangladesh (Roy et al., 1997), a group of mothers of breastfed infants received a single oral high-dose supplement of vitamin A soon after birth. Their infants had significantly fewer days of illness from respiratory infections during the first six months of life than infants of mothers from the same socio-economic group who were not given the supplement.

The earlier the single dose (200,000 IU orally) is given to a lactating woman, the sooner the vitamin A status of her breastfed child will be improved (WHO, 1997). A high-dose vitamin A supplement can be harmful to a fetus (WHO/MI, 1997). Therefore, it should *not* be given during pregnancy or anytime beginning around eight weeks after childbirth when women are at heightened risk of pregnancy (especially if they are not fully breastfeeding).

BEST COPY AVAILABLE

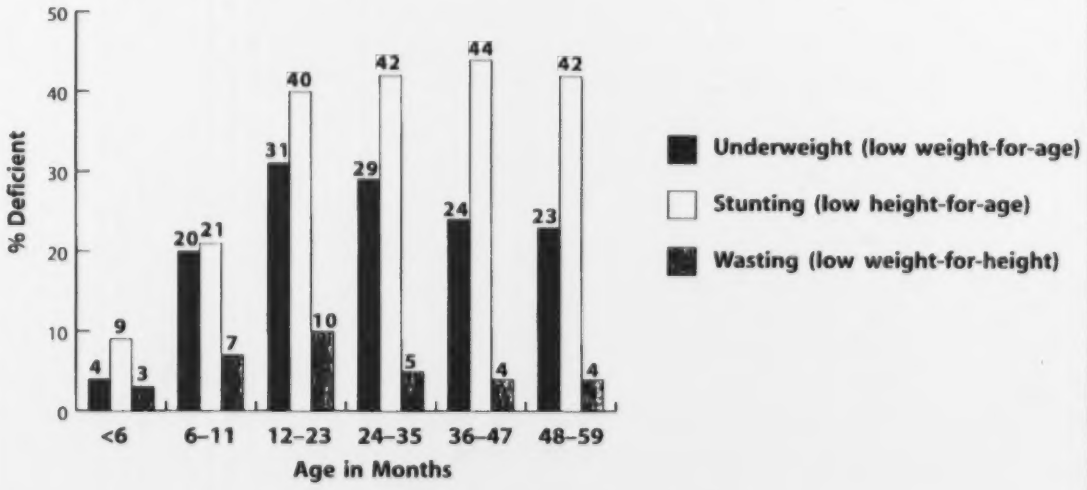
II. Recommended Feeding Practices to Improve the Nutrition of Children 6 to 24 Months

Children are at highest risk of nutritional deficiency and growth retardation between the ages of 6 and 24 months. The prevalence of malnutrition within a population, as measured by growth retardation, usually peaks in children 12 to 24 months of age. As illustrated in Figure 2, the prevalence of stunting (low height-for-age) approaches 40 percent among children in this age group and is only slightly higher in older groups of children.

Short-term nutritional deficiencies, as evidenced by wasting (low weight-for-height), are also most prevalent in the 12- to 24-month age group. Although wasting drops off sharply in the third year, children are unable to compensate for their early poor feeding and continue to be stunted for the rest of their lives. By age 2–3 years, children's weights may become appropriate for their lower heights, but little can be done to bring these children up to the stature of well-nourished children. For girls, the consequences of stunting are heightened risks of obstructed labor during childbirth since stunting affects the size of the birth canal (pelvic size). In addition, a stunted woman is more likely to give birth to a low birth weight baby.

Underwood (1985) describes the period between 6 and 24 months as a critical transition period when the "exposure to environmental pathogens is most intense, the likelihood of inadequate nutrient intake most probable, and the emotional trauma of less intimate maternal infant contact most stressful." The recommended practices to improve the nutrition of children between 6 and 24 months address these risks. These practices, listed in Box 2, focus on optimal feeding behaviors, adequate dietary intake, hygienic food preparation, and the caregiver's attentiveness to a child's needs.

Figure 2. Malnutrition Prevalence in 15 Countries by Age (average prevalence)



% Deficient refers to the percentage of malnourished children below -2 Standard Deviations

Source: Demographic and Health Surveys, 1991–1995.

Note: All DHS countries with anthropometric data in the 1991–1995 surveys were included: Cameroon, Colombia, Dominican Republic, Egypt, Guatemala, Jordan, Madagascar, Malawi, Namibia, Niger, Nigeria, Pakistan, Peru, Tanzania, and Zambia.

Box 2. Recommended Feeding Practices to Improve the Nutrition of Breastfed Children 6 to 24 Months

- Continue frequent, on-demand breastfeeding, to 24 months and beyond.
- Introduce complementary foods beginning around six months of age.
- Increase food quantity as the child ages while maintaining frequent breastfeeding.
- Increase complementary feeding frequency as the child ages, using a combination of meals and snacks.
- Gradually increase food thickness and add variety as the child ages, adapting the diet to the child's requirements and abilities.
- Diversify the diet of both the breastfeeding mother and the child by including fruits, vegetables, fortified staple foods, and/or animal products to improve quality.
- Practice active feeding.
- Practice frequent and active feeding during and after illness.
- Practice good hygiene and proper food handling.

Many of the recommendations are aimed at increasing energy intake. This can be done by:

- breastfeeding more frequently,
- feeding children complementary foods more often and/or providing more energy-dense foods,
- making portion sizes larger (up to the limit of a child's hunger and stomach capacity), and
- practicing active feeding (adapting the feeding method to the child's changing psychomotor abilities, actively encouraging the child to eat, and providing a supervised environment).

Micronutrient intake can be increased by diversifying the diet to include fruits, vegetables, and animal products; using fortified foods; and/or giving micronutrient supplements. Choosing food combinations that enhance micronutrient absorption is also important. Improving the micronutrient content of the maternal diet will improve the quality of a woman's breastmilk.

In many areas, local, cultural, and environmental constraints make it difficult to practice all of the recommended practices. Adaptations will need to be made; however, a child's nutritional status is likely to be compromised unless most of these practices are adopted. Programs to improve complementary feeding should review existing studies and conduct local assessments to understand the multiple factors that affect feeding practices. These assessments will determine the appropriate emphasis to give to each of the recommended practices. Local studies should identify local diets and current good practices to be supported, test options for improving the traditional diet and changing related feeding practices, and identify target audiences and effective strategies for reaching them.

A discussion of each of the recommended feeding practices to improve the nutrition of breastfed children 6 to 24 months of age follows.

Continue frequent, on-demand breastfeeding, including night feeding for infants

There are several reasons for recommending frequent, on-demand breastfeeding of older infants and toddlers.

- ***Breastmilk remains an important source of energy and fat.*** Breastmilk is relatively high in fat compared with most complementary foods. Based on estimates, breastfed infants need only 25 percent of their calories from fat in complementary foods compared with 35–45 percent for non-breastfed infants (Brown et al., 1998). When complementary foods are low in fat,

the fat in breastmilk may be essential for the utilization of vitamin A.

- ***Breastmilk's contribution to the supply of vitamins and high-quality protein may be substantial, depending on the levels in complementary foods.*** Studies in Bangladesh reported that breastmilk contributed nearly half of the protein intake and 60 percent of daily energy and vitamin A intake in the diet of children over two years of age (Brown et al., 1982). In a study of rural West African children over one year of age, Prentice and Paul (1990) reported that breastmilk was the most important source of vitamin A and fat.
- ***Breastfeeding is extremely important during illness.*** Children often continue breastfeeding even when they are anorexic and refuse other foods.
- ***Breastmilk continues to reduce the risk of infection.*** Besides providing young children with an important, high-quality food, breastfeeding continues to reduce the risk of infection (especially diarrhea, including shigellosis), even in the older infant and young child (Ahmed et al., 1992; Mobak et al., 1994; Clemens et al., 1986). Sustained breastfeeding also reduces the risk of childhood cancer (Davis, et al., 1988).
- ***Breastfeeding helps to suppress fertility.*** Breastfeeding can significantly reduce fertility beyond the first six months among populations where contraceptive use is limited. Women who breastfeed their infants at frequent intervals over prolonged periods of time have lower fertility than women who breastfeed infrequently and for shorter durations (VanLandingham et al., 1991).

Introduce complementary foods beginning around six months of age

By about six months of age, breastmilk alone cannot meet most babies' total energy and vitamin/mineral requirements. At this time complementary feeding should begin. Complementary feeding refers to the period when other foods or liquids are provided along with breastmilk. Complementary foods are any non-breastmilk foods given to young children during this period.

In many countries, nutrition guidelines continue to recommend introducing complementary foods between four and six months based on the assumption that breastmilk alone may not be adequate to support the growth of some infants during this period. Some have suggested that complementary feeding should begin before six months to get infants used to eating other foods. However, a study in Honduras (Cohen et al., 1995) showed that early initiation does not result in improved growth velocities or food acceptance. The study compared food consumption patterns and growth of infants who were started on foods at four months to the consumption patterns and growth of those who began eating complementary foods at six months. There were no differences in food acceptability or food consumption at 9–12 months between the two groups. Infants consumed similar amounts and varieties of foods whether or not they had solids prior to six months of age.[3]

Several studies in Thailand, Peru, Honduras, and the United States have documented that early initiation (< 6 months) of complementary foods replaces breastmilk and does not increase caloric intake (Brown et al., 1998). None of these studies reported any benefits for the child's growth of early complementary feeding. Because breastmilk is generally higher in nutritional value than the complementary foods and liquids fed to children in developing countries, replacing it can negatively affect the fat, energy, and micronutrient intake of young infants.

Even when breastfeeding frequency remains high, the total amount obtained from each breastfeed decreases when other foods are fed. The implications are twofold: (1) maintain high levels of breastfeeding when introducing complementary foods, and (2) ensure that complementary foods are as high in nutrients as possible.

Many breastfeeding counselors recommend that women breastfeed before feeding complementary foods, especially until

Note 3
Frongillo and Habicht (1997) raise some concerns about the study, particularly the high non-random drop-out rate among the exclusive breastfeeding group and an inadequate sample size to show significant differences in weight and length.

the child is 10 to 12 months of age. This recommendation is intended to maximize breastmilk consumption and stimulate breastmilk production. A review by Armstrong (1993) indicated that there is no scientific evidence showing that breastfeeding prior to complementary feeding negatively affects infant growth. Armstrong terms the recommendation to breastfeed first "speculative," a "common-sense position" that communicates the importance of breastmilk for infant health and nutrition.

Breastfeeding before each complementary feeding is also promoted for its role in fertility reduction. This practice is one of the criteria for extended use (nine months rather than six months) of the Lactational Amenorrhea Method. Breastfeeding before complementary feeding helps to maintain the frequency and intensity of breastfeeding necessary for the effectiveness of the Lactational Amenorrhea Method (Cooney et al., 1996). The other criterion for extended LAM is amenorrhea. If these criteria are not met, the chance of pregnancy is increased.

Increase food quantity as the child ages while maintaining frequent breastfeeding

Adequate energy intake can be ensured through age-appropriate, energy-dense foods, frequent feedings, and continued breastfeeding. Table 1 illustrates that the energy needed from complementary foods depends on the child's age and the level of breastmilk intake. As the child ages and breastmilk intake decreases, complementary foods must meet a greater proportion of the energy requirements.

Listed below are estimates of the recommended daily energy intake from complementary foods for various age groups. They represent average requirements for *breastfed* children. Local research is needed to determine the best combinations of foods and feeding practices to achieve these levels of energy intake. Individual children may require more or fewer additional calories and nutrients depending on their nutrient stores, activity levels, and growth requirements.

Table 1. Energy Needed from Complementary Foods to Meet Daily Requirements by Level of Breastmilk Intake

		Level of Breastmilk Intake[a]		
Age in months	Daily energy requirement (kcal)[b]	High breastmilk intake[c] (Mean +2 S.D.)	Average breastmilk intake[c]	Low breastmilk intake[c] (Mean - 2 S.D.)
		Kilocalories needed from complementary foods		
6–8	680	75	270	465
9–11	830	230	450	675
12–23	1090	490	750	1000

Source: Brown et al., 1998.

[a] Figures have been rounded.

[b] Estimates of average breastmilk intake are: 410 kcal for a 6- to 8-month-old, 380 kcal for a 9- to 11-month-old, and 340 kcal for a 12- to 23-month-old. These estimates need to be adjusted for the size of the infant.

General feeding guidelines for breastfed children with average breastmilk intake (defined in the footnote to Table 1), and sample daily diets are shown below.

- Provide 6 to 8-month-old infants *approximately* 280 kcal per day[4] from complementary foods.
  (Example: ½ cup rice, 1½ tablespoons mung dal [lentils], 3 tablespoons dark green leafy vegetables, and 1 teaspoon groundnut oil)[5]
- Provide 9 to 11-month-old infants *approximately* 450 kcal per day from complementary foods.
  (Example: 1½ cups plain maize pap, ½ banana, ½ cup rice and beans, 1 ladle palm oil/tomato/pepper stew, 1½ tablespoons chopped chicken, and 1 fried bean cake)[6]
- Provide 12 to 24-month-old children *approximately* 750 kcal per day from complementary foods.
  (Example: 1 cup rice, 3 tablespoons dal [lentils], 1 teaspoon oil, a small piece of fish, ½ cup boiled potato, 1 tablespoon coconut, 2 tablespoons molasses, and 1 small mango)[7]

All three of these diets provide, in addition to breastmilk, sufficient calories, protein, and vitamin A for the specific age group. However, because these diets are low in animal products, their iron and zinc content is inadequate. For children 6 to 24 months, it is difficult to obtain sufficient amounts of these nutrients without fortified foods or micronutrient supplements.

Increase feeding frequency as the child gets older, using a combination of meals and snacks

Guidelines on feeding frequencies should take into account the energy density and the amount of various foods served to a child. The continuation of frequent, on-demand breastfeeding is important to ensure that complementary foods do not displace breastmilk. Breastmilk should be the sole source of nutrition in the first six months and the primary source in the second six months.

Recent estimates (Brown et al., 1998) of energy requirements and breastmilk intakes suggest the following complementary feeding frequencies, using a combination of meals and snacks:

- Feed complementary foods to 6 to 8-month-old infants 2–3 times per day.
- Feed complementary foods to 9 to 11-month-old infants 3–4 times per day.
- Feed complementary foods to 12 to 24-month-old children 4–5 times per day.

Differences in local foods and recipes and variations in breastfeeding practices underscore the need to develop local guidelines on the types and quantity of food children should consume at different ages as well as the feeding frequency needed to meet their energy requirements. Local diets will also need to be assessed for their micronutrient content. Tools such as *Designing by Dialogue* (Dickin et al., 1997) can help in the development of recommendations for feeding practices and appropriate local foods for young children.

Gradually increase food thickness and variety as the child gets older, adapting the diet to the child's requirements and abilities

As the gastrointestinal tract and immune system mature and other developmental changes occur, a child is ready to ingest a variety of foods. The foods consumed should change in consistency and composition, becoming thicker and more energy dense. Initially, porridge and other semi-solid foods are suitable first foods because infants are physiologically ready to accept them. They are also more calorically dense than liquids, such as soups.

When infants are capable of eating thicker semi-solid foods, such as mashed bananas, these foods should be introduced because they tend to be more calorically dense than purées. One disadvantage, however, is that thicker semi-solid foods usually take longer to feed than purées, until the child reaches about 10 months of age (Gisel, 1991). By 10–12 months of age, most infants can pick food up by hand and are ready to eat solid foods, such as bread. At this age, the variety of foods should be increased by feeding mashed family foods and various fruits and

Note 4
The difference from the number shown in Table 1 is due to rounding.

Note 5
Adapted from Cameron and Hofvander, 1983.

Note 6
Dickin et al., 1997.

Note 7
Wollinka et al., 1997.

vegetables (Dickin et al., 1997). At about 12 months, most children are ready to make the transition to the family diet.

Guidelines for the introduction of various foods are summarized below.

- Feed mashed and semi-solid foods (softened with breastmilk, if possible) to infants, beginning around six months of age.
- Feed energy-dense combinations of soft foods to 6–11 month olds.
- Introduce "finger foods" (snacks that can be eaten by children alone, such as grated vegetables and bread strips) at about eight months of age.
- Make the transition to the family diet at about 12 months of age.

Diversify the diet to improve quality

Optimal feeding of children 6 to 24 months and older requires adequate protein and micronutrient intake[8] as well as energy intake to ensure growth and proper metabolic functions of the body. This can be done in the following ways:

- Feed fruits and vegetables daily, especially those rich in vitamin A and other vitamins.
- Feed meat, poultry, or fish daily or as often as possible (even small quantities help).
- Use fortified foods, such as iodized salt, vitamin A-fortified sugar or other vitamin A-fortified products, and iron-enriched flour or other staples, when available.

When animal products, fortified foods, and/or vitamin A-rich foods are not available, vitamin-mineral supplements, containing appropriate levels of micronutrients, should be given to children to prevent anemia, zinc deficiency, vitamin A deficiency, and other micronutrient deficiencies.

Feed fruits and vegetables daily, especially those rich in vitamin A

The ability of food sources to prevent vitamin A deficiency depends on the content of vitamin A compounds in different foods, the amount of vitamin A that can be absorbed and utilized, and the vitamin A status of the person consuming the food (Sommer and West, 1996). Provitamin A carotenoids are found in fruits and vegetables. Dark green leafy vegetables are a good source of provitamin A carotenoids, but orange/yellow fruits and vegetables are an even better source. Provitamin A carotenoids in orange/yellow fruits (mango, papaya) and yellow/red vegetables (pumpkin, sweet potatoes) are twice as effective in enhancing serum vitamin A levels as those found in dark green leafy vegetables (Bloem et al., in press).

Because vitamin A and its precursors are fat soluble, vitamin A can be more fully utilized when fruits and vegetables are mixed or eaten with a fat source, thus enhancing their absorption and increasing the energy density of the foods without sacrificing nutrient density. For the same reason, breastmilk, which is a major source of fat in the diet, may help to improve vitamin A status. As noted earlier, breastmilk is also a good source of vitamin A. For example, a breastfed child who is 9–11 months old could meet all of the daily vitamin A requirements by eating a quarter of a mango. A non-breastfed child, on the other hand, would require a whole mango (USDA, 1997).

Feed meat, poultry, fish, or other animal products daily or as often as possible, if feasible and acceptable

In developing countries, where most diets are based on staple grains and legumes, micronutrient deficiencies are very common. The vitamin A, iron, and zinc found in grains and vegetable sources are less available and less efficiently stored than those found in animal products. Daily or frequent consumption of animal products helps to avert deficiencies of these essential micronutrients.

Retinol, a vitamin A compound, is found only in animal sources (eggs, milk, cheese, liver, and fish oils). To replace 1 µg of retinol available in animal products, 6 µg of beta-carotene (in orange and yellow fruits and vegetables) and 12 µg of other provitamin carotenoids (such as in dark green leafy vegetables) are needed (Olson, 1995). Only 1.4 percent of the iron in spinach and 7 percent in soybeans can

Note 8
Micronutrients are frequently classified as Type I and Type II nutrients (Golden, 1995). Although growth continues in the early stages of Type I nutrient deficiencies, characteristic clinical signs and symptoms develop. Health workers are trained to recognize, diagnose, and treat such Type I deficiencies as anemia (iron), beri-beri (thiamin), scurvy (vitamin C), xerophthalmia (vitamin A), and iodine deficiency disorders. Deficiencies in Type II nutrients, on the other hand, exhibit no specific clinical signs but can result in growth failure and anorexia. When growth failure occurs, it is difficult to determine which nutrients might be responsible. Zinc, magnesium, phosphorus, and potassium are among the Type II nutrients. In addition to these minerals, protein is classified as a Type II nutrient. (Note: Additional micronutrients such as riboflavin, niacin, B_6, and B_{12} may also be deficient in some populations.)

be absorbed, compared with 20 percent of iron from red meat (Scrimshaw, 1991).

Use fortified foods, when available; give vitamin-mineral supplements when animal products, fortified foods, and/or vitamin A rich foods are not available

Although animal products are excellent sources of micronutrients, they are often unavailable, unaffordable, or unacceptable (such as to a vegetarian population). Moreover, it is difficult to meet the iron requirements of a rapidly growing child even when animal products (flesh meats) are consumed regularly.

If young children are unable to meet all of their micronutrient requirements through the consumption of animal products and vitamin A-rich fruits and vegetables, they should eat fortified foods, such as iodized salt, vitamin A-fortified sugar or other vitamin A-fortified products, and iron-enriched flour or other staples, when available. If fortified foods are not available, the following supplements may be needed:

- ***Iron***: UNICEF recommends oral iron supplements daily (12.5 mg per day) to infants 6 months to 1 year of age. A solution of 25 mg/ml of iron can be given to an infant by dropper with 10 drops (0.5 ml) per dose. It would be feasible to add 10 mg of zinc to this preparation (Nestel and Alnwick, 1997).[9] If the prevalence of anemia is known to be very high (40 percent or more), supplements should be continued until 24 months of age. Low birth weight infants are at particular risk of iron deficiency and may need to take oral iron supplements (12.5 mg/day) starting from three months of age and continuing for at least nine months (UNICEF/WHO, 1995).
- ***Vitamin A***: Bi-annual dosing with high-dose vitamin A as retinol (100,000 IU for children 6–11 months and 200,000 IU for those 12–60 months of age) can enhance vitamin A stores in areas where vitamin A deficiency occurs (WHO, 1997). Consumption of dietary sources of vitamin A is often inadequate to eliminate marginal deficiency in the population (de Pee et al., 1995).
- ***Iodine***: If the soil is low in iodine and seafood sources are lacking, iodine must be obtained through fortification or supplements. Consumption of salt fortified with iodine will prevent iodine deficiency in pregnant women, children, and other vulnerable groups. Breastfeeding mothers who consume iodized salt will have sufficient iodine in their breastmilk.
- ***Other micronutrients***: Depending on the local diet and health status, other supplements or multiple vitamin-mineral tablets may be necessary. For example, some young children are B_6 and B_{12} deficient because of malabsorption in the gut or a deficiency in the child's diet or the diet of the lactating mother. Riboflavin is low in diets that contain few animal products, and vitamin C is often only seasonally available. Zinc intake is generally low when iron intake is low. Zinc has been shown to enhance growth and reduce infection in young children.

Practice active feeding

Active feeding refers to caregiver behaviors that may help to increase a child's food intake. These behaviors are listed below.

- Feed infants directly and assist older children when they feed themselves.
- Offer favorite foods and encourage children to eat when they lose interest or have depressed appetites.
- If children refuse many foods, experiment with different food combinations, tastes, textures, and methods for encouragement.
- Talk to children during feeding.
- Feed slowly and patiently and minimize distractions during meals.
- Do not force children to eat.

Positive reinforcement, persistence, and supervised feedings are characteristics of active feeding. Children of caregivers who are passive and non-responsive to their needs are more likely to be malnourished than children of attentive caregivers.

Note 9
The impact of such a preparation on iron and zinc status is only now being tested.

In addition to nutritional benefits, active feeding stimulates a child's verbal and cognitive development (Engle et al., 1997).

A major problem that can be addressed by active feeding is the high prevalence of anorexia observed among young children. Depressed appetites are often associated with diarrhea and fever but are also prevalent in children who are not ill. Many caregivers only encourage children to eat when they are sick, but not at other times. Encouragement is needed, even when children do not appear hungry or refuse new foods. This can be done by offering additional food or second helpings, showing children how to eat, and talking to them while they eat.

Adequate time for feeding, the caregiver's knowledge of the amounts of different foods that a child needs to eat, and self-confidence contribute to active feeding. If a child refuses food, a self-confident caregiver does not assume that the child "knows best" but realizes that the food should be offered numerous times until the child becomes accustomed to eating it. Some caregivers may feel that active feeding is too time-intensive. They need to be assured that this time-intensive period is normal and relatively brief.

Practice frequent and active feeding during and after illness

Illness affects both dietary intake and nutrient utilization. Due to loss of appetite, sick children frequently reject food or consume only small quantities. Even when they eat food, nutrients are often lost because the illness inhibits their absorption or drains them away through diarrhea and vomiting. The following advice is offered to caregivers of children 6 to 24 months of age.

- During illness, increase breastfeeding, increase fluid intake, and patiently encourage children to eat their favorite foods.
- After illness, feed children more often than usual and encourage children to eat more food at each sitting.

Breastfeeding is particularly critical during illness because breastmilk, a nutritious, easily digestible food, reduces protein and caloric loss at a time when children frequently lose their appetite for other foods and liquids. For example, studies in rural Peru found that during diarrheal episodes, breastfed children maintained their breastmilk intake; however, total caloric intake from other foods decreased by 10–20 percent (Brown et al., 1990). Besides helping to maintain energy intake, breastfeeding helps prevent dehydration and comforts the sick child.

Practice good hygiene and proper food handling

To ensure that foods given to children are safe and transfer nutrients, not pathogens, caregivers should:

- Wash caregivers' and children's hands before food preparation and eating.
- Keep all food preparation surfaces clean; use clean utensils to prepare and serve foods.
- Cook food thoroughly.
- Avoid contact between raw foodstuffs and cooked foods.
- Serve foods immediately after preparation; avoid storing cooked food.
- Wash fruits and vegetables.
- Use safe water.
- Use clean cups and bowls; never use feeding bottles.
- Protect foods from insects, rodents, and other animals.
- Store non-perishable foodstuffs in a safe place (separate from pesticides, disinfecting agents, or other toxic chemicals).
- Keep all food preparation premises clean.

These optimal practices are based on principles set forth by the World Health Organization (1996). Program planners and communicators will need to determine which of these recommended practices deserve emphasis within a specific socioeconomic and environmental context.

One of the causes of high rates of malnutrition among children 6 to 24 months is the introduction of pathogens in contaminated feeding bottles and foods. Contamination is also the result of poor ba-

sic hygiene, sanitation, and methods of food preparation. Food is often prepared several hours before it is consumed and then stored at temperatures that promote the growth of pathogens. Insufficient cooking or reheating of food can also result in food-borne illnesses. Foods should be cooked thoroughly and fed as soon as they are cool enough to eat. Foods for infants should not be stored, unless they can be kept cold (below 10° C) or hot (above 60° C) and in clean, covered containers (WHO, 1993). Because bottles are particularly hard to clean, they should not be used for infant feeding.

Acidified foods (such as yoghurt) or fermented foods are less subject to contamination since the acid helps prevent the growth of bacteria. Foods that do not need to be cooked, such as a banana peeled immediately prior to consumption, are another way of providing foods free from contamination. Fruits and vegetables should be washed and peeled if possible. Those that cannot be peeled should be cooked to kill bacteria.

Hand washing can help reduce contamination and the risk of diarrhea. Keeping children's hands clean is important because children put their hands in their mouths many times when feeding themselves. Caregivers need to wash their own hands with soap before feeding children, a practice requiring substantial behavior changes in places where hand washing with soap is infrequent. Providing a clean surface for the child to feed him/herself is also important.

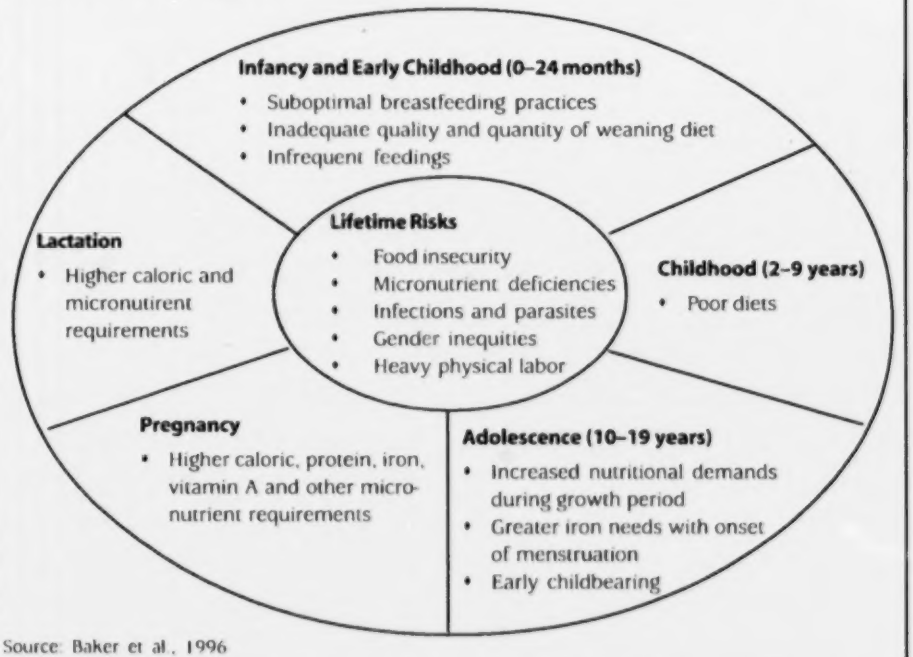
III. Recommended Dietary Practices to Improve the Nutrition of Adolescent Girls and Women of Reproductive Age

As noted in the previous chapter, nutritional neglect during the first two years of life has immediate and often long-term negative consequences on growth and development. This chapter examines the impact of nutritional stress during adolescence and the reproductive years in women and the next generation. As illustrated in Figure 3, the following risks to nutritional status are present throughout life: food insecurity, micronutrient deficiencies, infections and parasites, gender inequities, and heavy physical labor. The outer circle shows additional risks during different stages of the life cycle.

In most developing countries, women spend a larger proportion of their reproductive years pregnant, lactating, or pregnant and lactating. McGuire and Popkin (1990) estimate that on average, women in Africa and Asia between the ages of 15 and 45 are pregnant or lactating 30–48 percent of their time. The cumulative effect of frequent, closely spaced pregnancies, negative energy balance, and micronutrient deficiencies can lead to a condition known as "maternal depletion syndrome" (Winkvist et al., 1992).

Recommendations for improving the nutrition of adolescent girls and women of reproductive age, set forth in Box 3, focus on dietary practices that affect energy and micronutrient intake at different points in the life cycle: adolescence, the non-pregnant/non-lactating period, pregnancy, and lactation. At all stages, energy is needed for body maintenance. Additional energy is needed to support adolescent growth, fetal growth during pregnancy, and milk production during lactation. Energy demands are at a maximum level when an adolescent girl is pregnant and lactating.

Figure 3. Risks to Female Nutritional Status during Different Periods of Life


Infancy and Early Childhood (0–24 months)
• Suboptimal breastfeeding practices
• Inadequate quality and quantity of weaning diet
• Infrequent feedings
Lactation
• Higher caloric and micronutirent requirements
Lifetime Risks
• Food insecurity
• Micronutrient deficiencies
• Infections and parasites
• Gender inequities
• Heavy physical labor
Childhood (2–9 years)
• Poor diets
Pregnancy
• Higher caloric, protein, iron, vitamin A and other micronutrient requirements
Adolescence (10–19 years)
• Increased nutritional demands during growth period
• Greater iron needs with onset of menstruation
• Early childbearing

Source: Baker et al., 1996

BEST COPY AVAILABLE

Box 3. Recommended Dietary Practices to Improve the Nutrition of Adolescent Girls and Women of Reproductive Age

Recommended at all times

- Increase food intake, if underweight, to protect adolescent girls' and women's own health and establish reserves for pregnancy and lactation.
- Diversify the diet to improve the quality and micronutrient intake.
  - Increase daily consumption of fruits and vegetables.
  - Consume animal products, if feasible and acceptable.
  - Use fortified foods, such as vitamin A-enriched sugar and other products and iron-enriched and vitamin-enriched flour or other staples, when available.
- Use iodized salt.
- If micronutrient requirements cannot be met through available food sources, supplements containing iron, vitamin A, zinc, and other nutrients may be needed to build stores and improve women's nutritional status.

Recommended during periods of special needs

At certain times, girls and women have heightened nutritional requirements. During these times, they should follow the above recommendations *plus* those listed below.

During adolescence (between 10–19 years of age)
- Increase food intake to accommodate the adolescent "growth spurt" and to establish energy reserves for pregnancy and lactation.

During pregnancy
- Increase food intake to support fetal growth and future lactation.
- Take iron/folic acid tablets daily.

During lactation
- Eat the equivalent of an extra meal per day.
- In high risk areas, take a high-dose vitamin A capsule (200,000 IU) as soon after delivery as possible but no later than 8 weeks postpartum to build stores, improve breastmilk quality, and reduce maternal morbidity.

During the interval between the cessation of lactation and the next pregnancy
- Allow adequate time (at least six months) between the cessation of lactation and the next pregnancy to replace and build up energy and micronutrient reserves.

Micronutrient requirements also change at various points in the life cycle. Adolescent growth, menstruation, pregnancy, and lactation can exacerbate micronutrient deficiencies. For some micronutrients, such as vitamin A, lactation puts greater demands on maternal reserves than pregnancy. In the case of iron, the period of lactational amenorrhea is the time of lowest iron loss for women of reproductive age.

LINKAGES' recommended dietary practices address women's changing nutrient requirements. While pregnancy represents an important opportunity for health and nutrition interventions, nutritional problems must also be addressed at other times in a woman's life, for the sake of

both the woman and her children. As shown in Box 3, some of the recommendations apply to all women; others apply to periods of special needs.

Increasing Food Intake

Women of reproductive age, if underweight, should increase food intake to protect their own health and establish reserves for pregnancy and lactation

In developing countries chronic energy deficiency is very common among women of reproductive age. Many women are too thin (Body Mass Index[10] less than 18.5) or underweight (weight less than 45 kg). Over 60 percent of women are underweight in South Asia, over 40 percent in South East Asia, and about 20 percent in sub-Saharan Africa (Gillespie, 1997). Functional consequences of chronic energy deficiency include heightened susceptibility to infection, reduced activity levels, and lower productivity (Shetty and James, 1994).

There is a strong association between low pre-pregnancy weight and intrauterine growth retardation,[11] as shown in a meta-analysis of 25 studies of maternal anthropometry and pregnancy outcome from 20 countries (WHO, 1995). Most low birth weight in developing countries is due to intrauterine growth retardation, which is primarily the result of maternal malnutrition either before conception or during pregnancy. Achieving the weight gain necessary in pregnancy to ensure adequate fetal growth and favorable birth outcomes may be difficult for women who enter pregnancy underweight and continue to engage in heavy physical labor. Increased energy intake by underweight women between reproductive cycles can improve birth weight and maternal health.

Adolescent girls should increase food intake to accommodate the adolescent "growth spurt" and to establish energy reserves for pregnancy and lactation

During adolescence (the period between 10 and 19 years), girls experience rapid physical growth and sexual maturation. Growth occurs faster in adolescence than at any other time, with the exception of the first year of life. Nutritional status can be undermined if adolescent girls' increased nutritional demands are unmet.

Adolescent girls' "growth spurt" occurs about 12–18 months before their first menstrual period, usually between 10 and 14 years of age. They continue to grow in height for up to seven years after the onset of menstruation (menarche). A well-nourished adolescent girl may reach full height as early as 16 years, whereas a malnourished girl, whose menarche has been delayed, may achieve full height as late as 23 years (Roche and Davila, 1972).

Adolescent girls are capable of conceiving before their body is fully developed. Completion of the development of the birth canal occurs two to three years after full height is reached (Moerman, 1982). Pelvic bone immaturity increases the risks of prolonged labor, pre-eclampsia, and cephalopelvic disproportion. Pregnancy puts adolescent girls at high risk of malnutrition, complications of pregnancy, and poor birth outcomes, including death. For adolescent girls under the age of 18, the risk of dying in childbirth is three times greater than for women between the ages of 20 and 29 (UNICEF, 1995). A key strategy for maintaining or improving the nutritional status and survival of adolescent girls is, therefore, to delay the first pregnancy.

Pregnant women should increase food intake to support fetal growth and future lactation

The nutritional demands during pregnancy are multiple. Maternal fat stores are needed to support fetal growth and future lactation. The amount of weight that should be gained during pregnancy depends on several factors, such as pre-pregnancy weight, activity level, and body size.

The average woman should gain about 10 kilograms during pregnancy, but many women in developing countries, particularly in South Asia, gain barely half this amount (McGuire and Popkin, 1990). For women who enter pregnancy with good nutritional status, the additional food intake

Note 10
The Body Mass Index (BMI) is an expression of the height in meters divided by weight in kilograms squared.

Note 11
Intrauterine growth retardation is evident in full-term babies who are born small-for-date. Low birth weight is also common among infants who are premature (born before 37 weeks).

BEST COPY AVAILABLE

required is the equivalent of about 200 kilocalories per day (Institute of Medicine, 1990). Examples of a 200 kilocalorie snack are listed below:

- 1 medium tortilla, 2 tablespoons refried beans, and ½ tablespoon oil = 194 kilocalories *or*
- 1 small orange, ¼ cup split peas, and ½ cup rice = 206 kilocalories *or*
- 1 piece of boiled cassava and 12 ground nuts = 197 kilocalories

For women who enter pregnancy underweight, more calories than shown in the above examples are needed to achieve adequate weight gain.

Inadequate weight gain during pregnancy is often the result of excessive demands on women's time and energy. Some women are unaware of the need for additional food during pregnancy. Others deliberately restrict their diet because they fear that a large baby will increase obstetric risks. Low caloric intake or weight gain during pregnancy is a major factor influencing birth weight, the single most important determinant of a child's chances for survival. Low birth weight, in turn, is an indirect indicator of women's nutritional status.

Trials in a number of countries have examined the effects of food supplements on weight gain and birth outcomes. Although differences in study designs make it difficult to generalize, a recent review by LINKAGES of the evidence from these studies concludes that increased caloric intake among severely (< 45 kg and BMI < 18.5) and moderately malnourished women (< 50 kg and BMI < 23) may lead to increases in birth weight. In moderately malnourished women, food supplements may not result in further improvements in birth weight because a larger proportion of weight gain is directed to the mother than to the fetus. For better-nourished women (> 50 kg and BMI > 23), food supplements are unlikely to affect maternal weight change or infant birth weight. Hence, the benefits of food supplements for maternal nutritional status and infant birth weight are greatest for undernourished women, particularly at times of the year when food is scarce and/or workload is high (Rasmussen, 1998), as recently demonstrated in a study in the Gambia (Ceesay et al., 1997). In the Gambian study, the number of low birth weight babies declined by almost 40 percent among pregnant women who received high-energy biscuits which provided around 1,000 kcal/day after 20 weeks of pregnancy. Still birth and perinatal mortality rates were almost cut in half when supplements were targeted at at-risk pregnant women.

***Lactating women* should eat the equivalent of an extra meal per day**

The National Academy of Sciences' Subcommittee on Nutrition during Lactation (Institute of Medicine, 1991) recommends that breastfeeding mothers consume around 2700 kcal per day (about 500 kcal per day more than a non-pregnant, non-lactating woman). The recommendation assumes that women can draw from fat stores accumulated during pregnancy. Malnourished women with few fat stores and a poor diet need more calories than the recommended level to meet their energy requirements during lactation. For underweight women and women with low weight gain during pregnancy, the National Academy of Sciences recommends a 650 kcal/day increase in energy intake during the first six months of lactation. This is about the equivalent of an extra meal and more than triple the estimated 200 kcal/day additional requirement during pregnancy. In transitional societies where obesity is a problem among certain populations, women may need fewer additional calories; however, they still require the same high levels of micronutrients.

Mothers with adequate fat stores produce milk higher in fat content; consequently, their infants need to suckle less to obtain sufficient energy. Both well-nourished and mildly malnourished women produce breastmilk of adequate quantity and high energy and protein quality. Deficiencies of some vitamins and minerals will result in lower levels of these nutrients in breastmilk (Prentice et al., 1994). Only under extreme conditions, such as famine, are the protein and energy composition of breastmilk significantly affected (Perez-Escamilla, 1995). While most malnour-

ished women can breastfeed successfully, their own health and nutritional status can be compromised if their nutritional stores are depleted to nourish their infants. Breastfeeding and maternal nutrition is the subject of a separate LINKAGES publication (forthcoming).

***Non-pregnant/non-lactating mothers* should allow an adequate period (at least six months) between the cessation of lactation and the next pregnancy to replace and build up energy and micronutrient reserves**

Overlap of lactation and pregnancy is common. Nearly half of the women studied in the Philippines experienced overlap (Siega-Riz and Adair, 1993). In a study in Guatemala, more than 50 percent of women breastfed during pregnancy, with a substantial number (44 percent) breastfeeding into the second trimester (Merchant et al., 1991). Increasing birth intervals and allowing at least six months between the cessation of lactation and the next pregnancy can help to replace and build up energy and micronutrient reserves. Besides improving women's immediate nutritional and health status, building up micronutrient and fat reserves between pregnancies can affect pregnancy outcomes, as discussed earlier.

Improving Micronutrient Intake

At all times, *adolescent girls and women of reproductive age* should diversify their diet to improve quality and micronutrient intake

Micronutrient deficiencies contribute to women's undernutrition. They also account for maternal and childhood deaths, blindness, and mental retardation. Less severe deficiencies impair intelligence and reduce working capacity and productivity. The two primary factors contributing to micronutrient deficiencies are inadequate intake of micronutrient-rich foods and inadequate utilization due to disease or some other factor in the diet. Inadequate consumption may be a result of cost, limited or seasonal availability of food, and inequitable intra-household distribution of food. LINKAGES' efforts are concentrated on improving variety in the family diet. Dietary approaches for improving micronutrient intake include the following:

- ***Increase daily consumption of fruits and vegetables***. Increased daily consumption of fruits and vegetables will improve micronutrient status of vitamins A, C, and B_6, as well as calcium (National Research Council, 1989). Increased vitamin C consumption from fruits and vegetables will enhance the iron bioavailability from other foods.
- ***Consume animal products, if feasible***. As noted earlier, animal products are excellent sources of protein, fat, and micronutrients. Many micronutrients are more easily absorbed and/or utilized by the body than those found in fruits and vegetables. The cost of animal products, however, may limit their consumption.
- ***Use fortified foods***, such as vitamin A-fortified sugar, other vitamin A-fortified products, iron-enriched flour, vitamin-enriched flour, or other fortified staples, when available.[12] As stated in a World Bank publication (1994), "Successful fortification of a staple food may be one of the most equitable health interventions available—especially if the slight cost of the additional nutrients is absorbed by the government—because it reaches everyone, including the poor, pregnant women and young children, populations that social services can never cover completely."
- ***Use iodized salt***. In some areas of the world, nearly everyone is at risk of a micronutrient deficiency. This is the case in areas where iodine is absent from the soil. Around 250 million women suffer from iodine deficiency, increasing the chances of miscarriage, stillbirth, and prematurity. During the early months of pregnancy, iodine deficiency can result in cretinism and mental retardation. Iodine deficiency is the single most common cause of mental retardation in the world. In Bangladesh, infants of women with goiter suffer twice as many neonatal deaths as infants of normal women.

Note 12
Data from the United States illustrate the importance of fortification even for an industrialized country. In 1977 only 5 percent of women 19–51 years of age met the Recommended Dietary Allowance (RDA) for iron. When the additional iron in fortified foods was included, 12 percent met the RDA (Popkin et al., 1996). The differences were even greater for thiamin, riboflavin, and niacin (12 percent vs. 35 percent, 27 percent vs. 43 percent, and 34 percent vs. 52 percent, respectively).

BEST COPY AVAILABLE

(PROFILES, 1993). The irreversible damage resulting from iodine deficiency can be prevented by the intake of minuscule amounts of iodine in iodized salt.

If micronutrient requirements cannot be met through available food sources, *adolescent girls and women of reproductive age* may need to take supplements containing iron, vitamin A, zinc, and other nutrients to build stores and improve women's nutritional status

Some micronutrients are concentrated in a few foods. If a woman does not have access to these foods, cannot afford them, or does not have a taste for them, micronutrient deficiencies are likely to occur unless she eats fortified foods or takes micronutrient supplements. Because of low caloric intake and the limited number of fortified foods, fortification may not result in substantial increase in the proportion of women with adequate dietary intakes.

Although pregnant women and, in some programs, postpartum women are generally the target populations for supplementation, these efforts are often too late, too short, or too limited to bring about the desired improvements.

- ***Micronutrient supplementation that begins during pregnancy is often too late.*** Folic acid and iron illustrate the problem of supplementation that begins in pregnancy.

  Folic Acid: Some defects in fetal development begin within the first few weeks of pregnancy, before most women start taking supplements (Perez-Escamilla, 1995). Recent evidence indicates that improving folate status prior to pregnancy reduces neural tube defects (such as spina bifida). Defects must be prevented by the 27th day of gestation when the posterior neural tube closes. This means that neural tube defects will occur before a woman knows she is pregnant and begins taking prenatal supplements (Molinari, 1993). For this reason the United States Public Health Service recommends that women of reproductive age in the United States who are capable of becoming pregnant take 400 µg (0 4 mg) of folic acid daily through fortified foods and supplements.

  Iron: As mentioned earlier, in developing countries iron deficiency is the most common micronutrient deficiency among women, resulting in a high prevalence of anemia. During early adolescence, iron requirements increase as girls experience a growth spurt and the onset of menses. An estimated 50 million pregnant and 320 million non-pregnant women in developing countries are anemic (Stoltzfus, 1995). Anemia causes extreme fatigue and reduces physical activity, productivity, and possibly a woman's capacity to care for her children. While anemia can be cured by daily iron supplementation throughout pregnancy, building iron stores to reduce the less severe but important levels of iron deficiency is difficult when supplementation is provided only during pregnancy. Pre-pregnancy supplementation, in addition to improving iron stores, can prevent poor birth outcomes (Klebanoff et al., 1991).

- ***The period of supplementation is often too short.*** In endemic areas, vitamin A is another micronutrient that may require longer-term approaches to improving micronutrient status and building stores. The Nepal Nutrition Intervention Project-Surlahi II study (NNIPS-II) found that provision of vitamin A for at least three months prior to pregnancy and throughout pregnancy was still associated with low levels of vitamin A in infants at six months of age (West et al., 1997). A study in Bangladesh showed that while supplementation of postpartum women with high-dose vitamin A was associated with improved breastmilk content at three months, high proportions of infants still had low vitamin A levels. The increased vitamin A in the breastmilk was unable to reverse vitamin A deficiency in many infants.

These infants probably were born with low vitamin A stores because their mothers were vitamin A-deficient during pregnancy (Rice et al., 1997).

- ***Limiting supplementation to one or two micronutrients diminishes effectiveness.*** Many women consume low levels of micronutrients and experience multiple micronutrient deficiencies throughout their reproductive years. Treating only one micronutrient deficiency may be less effective in improving overall nutrient status because of the interactions among nutrients. Addressing multiple deficiencies prior to pregnancy and lactation will improve women's current health and establish reserves to draw on during pregnancy and lactation.

The promotion of micronutrient supplements first requires an understanding of the levels of nutrients that should be included in the supplement and then an assessment of the quality control of appropriate supplements. In some places multiple micronutrient supplements, although available, are not suitable. For that reason, it is not yet appropriate to promote their widespread use unless adequacy and quality can be assured.

LINKAGES supports programs that provide women with iron/folic acid tablets during pregnancy and a high-dose vitamin A capsule soon after childbirth. At the same time, LINKAGES is encouraging dialogue on the potential for an appropriate multiple vitamin-mineral supplement for women and the development of international standards for such a supplement.

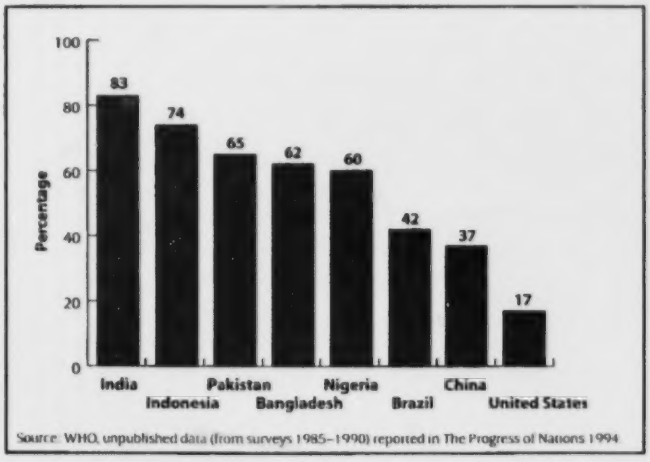
The reader is referred to a separate paper developed by LINKAGES, titled *The Case for Promoting Multiple Vitamin/Mineral Supplements for Women in Developing Countries* (Huffman et al., 1998), for an extensive discussion of the role of multiple vitamin/mineral supplements.[13]

Pregnant women should take iron/folic acid tablets daily

The need for additional iron during pregnancy is widely recognized. Iron requirements increase significantly during the second and third trimester of pregnancy because of the growth of the fetus and placenta and expansion of the mother's blood volume. In the third trimester, about 300 mg of iron are transferred from mother to fetus (WHO, 1994).

In developing countries, approximately 40 percent of women of reproductive age are anemic. During pregnancy the rate of anemia rises to 50 percent in many countries and much higher in some Asian countries, as shown in Figure 4. Severe anemia increases the risk of hemorrhage during childbirth, with an estimated 20 percent of maternal deaths attributed to anemia (Ross and Thomas, 1996).

Note 13
The LINKAGES Project believes that it is important to test delivery strategies for micronutrient supplements. Along with Population Services International (PSI), LINKAGES is testing the social marketing of a multiple-micronutrient supplement in Bolivia. At the same time, LINKAGES is promoting long-term solutions to improving micronutrient status, including dietary diversity and consumption of fortified foods.



Source: WHO, unpublished data (from surveys 1985–1990) reported in The Progress of Nations 1994

Figure 4. Pregnancy Anemia Rates (hemoglobin <11 mg/dl) in Countries with over 3 Million Births a Year

The recommended dosage for iron/folic acid during pregnancy is as follows:

- Pregnant women should take a daily supplement of iron/folic acid (60 mg of iron and 250–400 µg folic acid) for six months of pregnancy (or 120 mg of iron/folic acid for three months if women are not reached earlier) (Stoltzfus and Dreyfuss, 1998). Folic acid is included in the supplement because it helps to prevent anemia and reduces the risk of obstetric complications. Folic acid deficiency is known to contribute to anemia in some parts of India, western Africa, and Burma (Sloan et al., 1992).

Recent and current studies are helping to define the impact of improving the status of other micronutrients on pregnant women and their infants. Box 4 illustrates the potential impact of maternal deficiencies in folic acid and iron, as well as iodine, vitamin A, and zinc on health outcomes of mother and child.

Recent evidence suggests that in areas where iron deficiency exists, zinc deficiency is also common because zinc and iron are found in similar foods (animal products). Zinc deficiency during pregnancy has been associated with an increased incidence of low birth weight, preterm delivery, prolonged labor, prema-

Box 4. Potential Impact of Micronutrient Deficiencies during Pregnancy on Health Outcomes of Mother and Child

Deficiency	Impact on pregnant woman	Impact on fetus/infant
Folic acid	• Increases risk of anemia	• Increases risk of pre-term delivery, low birth weight, and neurological defects
Iodine	• Reduces physical capacity by causing lethargy and fatigue • Causes goiter • Reduces mental capacity	• Increases risk of spontaneous abortions, stillbirths, impaired fetal brain development, infant deaths, cretinism, and congenital abnormalities
Iron	• Increases risk of death from hemorrhage, spontaneous abortion, stress of labor, and other delivery complications • Reduces work capacity and economic productivity • Heightens fatigue and apathy • Diminishes ability to fight infection	• Increases chance of prematurity, low birth weight, and infant mortality • Possibly lowers iron status in newborns
Vitamin A	• Impairs immune system; increases severity of illness • Increases risk of maternal death • Increases risk of anemia • Inhibits normal iron utilization • Increases risks for some kinds of infections • Causes corneal disease, dry eyes, and night blindness	• May increase risk of infant vitamin A deficiency and reduce birth weight • Increases risk of anemia in infants
Zinc	• Increases risk of prolonged labor, intra- and postpartum hemorrhage,and hypertension	• Increases risk of spontaneous abortion, low birth weight, intrauterine growth retardation, prematurity, and deformities

ture rupture of the membranes, and maternal lacerations (Caulfield, 1996). In a study in Peru, 60 percent of women exhibited low zinc levels (Zavaleta et al., 1997). Studies in Guatemala, Nigeria, and Nepal also report low intakes of zinc (less than two-thirds of the Recommended Dietary Allowances) (Gibson, 1994). As in the case of iron, it is difficult to meet zinc requirements during pregnancy through dietary sources, unless animal products are consumed or foods are fortified. This problem may be addressed through a multiple vitamin-mineral supplement during pregnancy.

Pregnant women and their infants may also benefit from low-dosage vitamin A supplementation. High rates of vitamin A deficiency during pregnancy have been reported in many developing countries. In some areas, night blindness (an inability to see in dim light or at dusk) is considered a normal condition of pregnancy, often developing during the third trimester. Around 10–20 percent of pregnant women in rural South and Southeast Asia are estimated to experience night blindness during pregnancy. The extent of night blindness in Africa and Latin America is unknown (IVACG, 1997).

In the Nepal Nutrition Intervention Project, women suffering from night blindness were more likely to be anemic and underweight and at increased risk of infections and death than those without symptoms of night blindness (UNICEF, 1998). The results of the Nepal Nutrition Intervention Project showed that *low-dose (23,300 IU)* weekly supplementation of vitamin A or beta-carotene for at least three months prior to and during pregnancy lowered maternal mortality by an average of 44 percent (West et al., 1997), reduced night blindness by 38 percent in the vitamin A group and 16 percent in the beta-carotene group (UNICEF, 1998), and improved iron status among both pregnant and postpartum women (Stoltzfus et al., 1997). Based on a study in Indonesia, Suharno et al. (1993) estimate that about one-third of the hemoglobin decline during pregnancy in the study population could be attributed to vitamin A deficiency. They estimate that daily low-level supplementation of vitamin A could eliminate anemia in one-fourth of anemic women.

***Lactating women* should take a high-dose vitamin A capsule (200,000 IU) as soon after delivery as possible but no later than eight weeks postpartum to build stores, improve breastmilk quality, and reduce maternal morbidity**

Vitamin A supplementation of lactating women was discussed in Chapter II as a way of improving the vitamin A status of infants. A high-dose vitamin A capsule is safe during the first eight weeks postpartum and can help to improve breastmilk concentrations and maternal stores. In a rural low-lying area in Nepal, a study conducted in 1991 found that night blindness occurred in twice as many breastfeeding women as pregnant women (16 percent vs. 8 percent) (Katz et al., 1995).

In addition to vitamin A, maternal deficiencies in Group 1 nutrients (thiamin, riboflavin, iodine, selenium, B_6, and B_{12}) result in lower concentrations in breastmilk and can negatively affect infant health (Allen, 1994). The micronutrient status of a breastfeeding woman and the concentration of Group 1 micronutrients in her breastmilk can be improved if she eats more fruits, vegetables, and animal products; consumes fortified foods; and/or takes a micronutrient supplement.

For Group 2 micronutrients (folic acid, vitamin D, calcium, iron, copper, and zinc), micronutrient supplementation has little effect on breastmilk concentrations. These micronutrients are maintained in the breastmilk at the expense of the mother's own stores. Improving the intake of Group 2 micronutrients is more likely to benefit the mother than the infant.

BEST COPY AVAILABLE

Conclusion

The premise of this paper is that nutritional status reflects a cumulative process. In the case of severe malnutrition, the consequences are often immediate and obvious. But in many cases, the consequences of nutritional neglect may not be readily apparent until they appear in the next generation.

Nutritional deficiencies often begin before birth and persist throughout life. For that reason, this paper recommends practices from conception through the reproductive years. To some, the recommendations may seem simplistic: breastfeed, eat more, and eat better. However, the following statistics testify to the challenge of converting these recommendations into practices.

- Exclusive breastfeeding rates in most countries are very low. It is estimated that approximately 1–2 million infant deaths from diarrhea and acute respiratory diseases could be averted annually if more women breastfed exclusively for about six months and continued breastfeeding through the first year or more (Huffman et al., 1991).
- Poor maternal nutrition perpetuates a cycle of malnutrition. Approximately 19 percent of infants in developing countries are born with low birth weight (WHO, 1992). As a result of iodine deficiency in the maternal diet, around 28 million children are born each year at some risk of mental impairment (UNICEF, 1997).
- Micronutrient deficiencies persist because of inadequate intake of micronutrient-rich foods and inadequate utilization due to disease or some other factor in the diet. WHO estimates that 183 million children (excluding those in China) under four years of age are anemic. Between the ages of 6 and 18 months, iron deficiency tends to peak (Lozoff, 1990).

Improving infant and maternal nutrition will require personal behavior changes, increased community recognition and support for interventions to improve maternal nutrition, strategies for reaching young people and involving men, and greater availability of quality health services.

Summary List of Recommended Readings

Caulfield L, Huffman SL, Piwoz E. Interventions to improve complementary food intakes of 6–12 month old infants in developing countries: What have we been able to accomplish? Paper prepared for the LINKAGES Project. Washington, DC, 1998.

Dickin K, Griffiths M, Piwoz E. Designing by dialogue: A program planner's guide to consultative research to improve young child feeding. Washington DC: Academy for Educational Development, 1997.

Green CP. Improving breastfeeding behaviors: Evidence from two decades of intervention research. Paper prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development. Forthcoming.

Huffman SL, Baker J, Shumann J, Zehner ER. The case for promoting multiple vitamin/mineral supplements for women in developing countries. Paper prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development, 1998.

Labbok M, Cooney K, Coly S. Guidelines: breastfeeding, family planning, and the Lactational Amenorrhea Method—LAM. Washington, DC: Institute for Reproductive Health, 1994.

LINKAGES. Frequently asked questions on breastfeeding and HIV/AIDS. Washington, DC: Academy for Educational Development, 1998.

LINKAGES. Frequently asked questions on breastfeeding and maternal nutrition. Washington, DC. Academy for Educational Development, forthcoming.

LINKAGES. Facts for feeding on maternal food supplementation, forthcoming.

Lutter C. Quantifying the benefits of breastfeeding: An annotated bibliography. Prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development, 1998.

References

Ahmed F, Clemens JD, Rao MR, Sack DA, Khan MR, Haque E. Community-based evaluation of the effect of breast-feeding on the risk of microbiologically confirmed or clinically presumptive Shigellosis in Bangladeshi children. *Pediatrics* 1992; 90(3):406–11.

Allen, L. Maternal micronutrient malnutrition: Effect on breastmilk and infant nutrition and priorities for intervention. *SCN News* 1994, 11:21–24.

Anderson GC. Risk in mother-infant separation post birth. *IMAGE: Journal of Nursing Scholarship* 1989; 21:196–99.

Armstrong H. Breastfeed first or give soft foods first? A review of current recommendations: A discussion paper prepared for UNICEF. New York: UNICEF, July 1993.

Baker J, Martin L, Piwoz E. A time to act: Women's nutrition and its consequences for child survival and reproductive health in Africa. Washington, DC: Academy for Educational Development, 1996.

Bloem MW, dePee S, Darnton-Hill I. New issues in developing effective approaches for the prevention and control of vitamin A deficiency. *Food and Nutrition Bulletin*. In press.

Brown K, Dewey KG, Allen LH. Complementary feeding of young children in developing countries: A review of current scientific knowledge. WHO/UNICEF forthcoming.

Brown KH, Black RE, Becker S, Nahar S, Sawyer J. Consumption of foods and nutrients by weanlings in rural Bangladesh. *American Journal of Clinical Nutrition* 1982; 36:878–89.

Brown KH, Stallings R, Creed de Kanashiro H, Lopez de Romaña G, Black RE. Effects of common illnesses on infants' energy intakes from breast milk and other foods during longitudinal community-based studies in Huascar (Lima) Peru. *American Journal of Clinical Nutrition* 1990; 852:1005–13.

Cameron M, Hofvander Y. Manual on feeding infants and young children. 3rd ed. New York: Oxford University Press, 1983.

Ceesay SN, Prentice AM, Cole TJ, Foord F, Poskitt EME, Weaver LW, Whitehead RG. Effects on birth weight and perinatal mortality of maternal dietary supplements in rural Gambia: 5 year randomised controlled trial. *British Medical Journal* 1997; 315:786–790.

Caulfield L. Presentation at Zinc for Child Health Meeting. Johns Hopkins University. December 1996.

Caulfield L, Huffman SL, Piwoz E. Interventions to improve complementary food intakes of 6–12 month old infants in developing countries: What have we been able to accomplish? Paper prepared for the LINKAGES Project. Washington, DC, 1998.

Clemens JD, Stanton B, Stoll B, Shahid NS, Banu H, Chowdhury AKML. Breastfeeding as a determinant of severity in Shigellosis. *American Journal of Epidemiology* 1986; 123(4):710–20.

Cohen RJ, Landa Rivera L, Canahuati J, et al. Delaying the introduction of complementary food until six months does not affect appetite or mother's report of food acceptance of breastfed infants from 6–12 months in a low income Honduran population. *Journal of Nutrition* 1995; 125: 2787–92.

Cohen R, Brown KH, Canahuati J, Landa Rivera L, and Dewey KG. Effects of age of intro-

BEST COPY AVAILABLE

duction of complementary foods on infant breast milk intake, total energy intake, and growth: a randomized intervention study in Honduras. *Lancet* 1994; 344:288–93.

Cooney KA, Nyirabukeye T, Labbok MH, Hoser PH, Ballard E. An assessment of the nine-month Lactational Amenorrhea Method (MAMA-9) in Rwanda. *Studies in Family Planning* 1996; 27(3):162–71.

Davis MK, Civets DA, Graudard BI. Infant feeding and childhood cancer. *Lancet* 1988; 13:365–368.

deCarvalho M, Robertson S, Friedman A, Klaus M. Effect of frequent breastfeeding on early milk production and infant weight gain. *Pediatrics* 1983; 72(3):307–11.

dePee et al. Lack of improvement in vitamin A status with increased consumption of dark-green leafy vegetables. *Lancet* 1995; 346:75–81.

Dickin K, Griffiths M, Piwoz E. Designing by dialogue: A program planner's guide to consultative research to improve young child feeding. Washington DC: Academy for Educational Development, 1997.

Duncan B, Ey J, Holberg C, Wright A, Martinez F, Taussig L. Exclusive breast-feeding for at least 4 months protects against otitis media. *Pediatrics* 1993; 91(5):867–72.

Engle P, Lhotská L, and Armstrong H. The care initiative: Assessment, analysis and action to improve care for nutrition. New York: UNICEF, 1997.

Frongillo EA, Habicht J-P. Investigating the weanling's dilemma: Lessons from Honduras. *Nutrition Reviews* 1997; 55(11):390–95.

Gibson RS. Zinc nutrition in developing countries. *Nutrition Research Reviews* 1994; 7:151–73.

Gillespie S. Improving adolescent and maternal nutrition: An overview of benefits and options. UNICEF, 1997.

Gisel E. Effect of food texture on the development of chewing of children between six months and two years of age. *Developmental Medicine and Child Neurology* 1991;33:69–79.

Golden MHN. Specific deficiencies versus growth failure: Type I and Type II nutrients. *SCN News* No. 12, 1995.

Green CP. Improving breastfeeding behaviors: Evidence from two decades of intervention research. Paper prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development, Forthcoming.

Greene HL. Vitamin intakes during rapid growth. In: Heird WC, ed. Nutritional needs of the six to twelve month old infant. New York: Carnation Co., Glendale/Raven Press, Ltd., 1991:251–67.

Hobcraft J. Child spacing and child mortality. In: Demographic and Health Surveys World Conference. Vol. 2. Columbia, Maryland: IRD/Macro Systems, 1991.

Huffman SL, Baker J, Schumann J, Zehner ER. The case for promoting multiple vitamin/mineral supplements for women in developing countries. Paper prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development, 1998.

Huffman S, Yeager B, Levine R, Shelton J, Labbok M. Breastfeeding saves lives: An estimate of the impact of breastfeeding on infant mortality in developing countries. Washington, DC: Nurture, 1991.

International Vitamin A Consultative Group (IVACG). Maternal night blindness: Extent and associated risk factors. Washington, DC: IVACG Secretariat, September 1997.

Institute of Medicine. Nutrition during lactation. Washington, DC: National Academy of Sciences, 1991.

Institute of Medicine. Nutrition during pregnancy. Washington, DC: National Academy of Sciences, 1990.

Katz J, Khatry SK, West KP, et al. Night blindness is prevalent during pregnancy and lactation in rural Nepal. *Journal of Nutrition* 1995; 125:2122–27.

Klebanoff MA et al. Anaemia and spontaneous pre-term birth. *American Journal of Obstetrics and Gynaecology* 1991; 164:59–63.

Labbok M, Cooney K, Coly S. Guidelines: breastfeeding, family planning, and the Lactational Amenorrhea Method—LAM. Washington, DC: Institute for Reproductive Health, 1994.

Labbok M, Hight-Laukaran V, Peterson AE, Fletcher V, von Hertzen H, Van Look, P. Multicenter study of the lactational amenorrhea method (LAM): Efficacy, duration, and implications for clinical application. *Contraception*,1997; 55:327–36.

LeGrand TK, Mbacké Cheikh SM. Teenage pregnancy and child health in the urban Sahel. *Studies in Family Planning*, 1993; 24(3):137–49.

LINKAGES. Frequently asked questions on breastfeeding and maternal nutrition. Washington, DC: Academy for Educational Development, forthcoming.

Lozoff B. Has iron deficiency been shown to cause altered behaviors in infants? In: Dobbing J (ed). Brain, Behaviour and Iron in the Infant Diet. London: Springer-Verlag, pp. 107–31. 1990.

Lutter C. Quantifying the benefits of breastfeeding: An annotated bibliography. Prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development, 1998.

McGuire J, Popkin BM. Beating the zero sum game: Women and nutrition in the third world. In: Women and Nutrition. ACC/SCN Symposium Report Nutrition Policy Discus-

sion Paper. No. 6. Geneva: United Nations, 1990.

Merchant KM, Martorell R, Haas JD. Nutritional adjustments in response to reproductive stresses within Guatemalan women. *Journal of Tropical Pediatrics* Supplement, 1991; 37:11–14.

Mobak K, Gottschau A, Aaby P, Hojlyng N, Ingholt L, de Silva APJ. Prolonged breast feeding, diarrhoeal disease, and survival of children in Guinea-Bissau. *British Medical Journal* 1994; 308:1403–1406.

Moerman ML. Growth of the birth canal in adolescent girls. *American Journal of Obstetrics and Gynaecology* 1982; 143:528–32.

Molinari, J. Epidemiologic associations of multivitamin supplementation and occurrence of neural tube defects. In: Maternal Nutrition and Pregnancy Outcome. Keen C, Bendich A, Willhite C. *Annals of the NY Academy of Sciences* 1993; (678):130–36.

National Research Council. Committee on Diet and Health. Diet and health: Implications for reducing chronic disease risk. Washington, DC: National Academy Press, 1989.

Nestel P, Alnwick D. Iron/multiple micronutrient supplements for young children: Summary and conclusions of a consultation held at UNICEF, Copenhagen, Denmark, August 19–20, 1996. Arlington, VA: OMNI, 1997.

Newman J. Breastfeeding problems associated with the early introduction of bottles and pacifiers. *Journal of Human Lactation* 1990; 6(2):59–63.

Newman V. Vitamin A and breastfeeding: A comparison of data from developed and developing countries summary. San Diego, CA: Wellstart, 1993.

Olson, J. The bioavailability of dietary carotenoids. Presented at IVACG meeting. 1995.

Perez-Escamilla R. Periconceptional folic acid and neural tube defects: Public health issues. *Bulletin of PAHO* 1995; 29(3):250–63.

Perez-Escamilla R et al.. Maternal anthropometric status and lactation performance in a low-income Honduran population: Evidence for the role of infants. *American Journal of Clinical Nutrition* 1995; 61(3):528–34.

Popkin B et al. The nutritional impact of food fortification in the United States during the 1970's *Family Economics and Nutrition Review* 1996; 9(4):20–10.

Popkin BM, Adair L, Akin JS, et al. Breast-feeding and diarrheal morbidity. *Pediatrics* 1990; 86(6):874–82.

Prentice A, Paul AA. Contribution of breastmilk to nutrition during prolonged breastfeeding. In: Atkinson SA, Hanson LA, Chandra RK (eds). Breastfeeding, nutrition, infection and infant growth in developed and emerging countries. St. John's, Newfoundland, Canada: ARTS Biomedical Publishers, 1990:87–101.

Prentice AM, Goldberg GR, Prentice A. Body mass index and lactation performance. *European Journal of Clinical Nutrition* 1994; 48,Suppl. 3:S78–S89.

PROFILES. Iodine deficiency. Washington, DC: Academy for Educational Development, 1993.

Rasmussen K. Benefits to mother and child of maternal food supplementation during the reproductive cycle. Paper prepared for the LINKAGES Project. Washington, DC: Academy for Educational Development, 1998.

Rice A, Stoltzfus RJ, de Francisco A, Chakraborty J, Kjolhede CL, Wahed MA. Maternal vitamin A or beta-carotene supplementation in lactating Bangladeshi women: Effects on mothers and infants. Presentation at IVACG, Cairo, 1997.

Righard L, Alade MO. Effect of delivery room routines on success of first breast-feed. *Lancet* 1990; 336:1105–1107.

Roche AF, Davila GH. Late adolescent growth in stature. *Paediatrics* 1972; 50:874–80.

Ross J, Thomas EL. Iron deficiency anemia and maternal mortality. Profiles 3 Working notes Series No. 3. Washington, DC: Academy for Educational Development, 1996.

Roy SK, Islam A, Molla A, Akramuzzaman SM, Jahan F, Fuchs G. Impact of a single megadose of vitamin A at delivery on breastmilk of mothers and morbidity of their infants. *European Journal of Clinical Nutrition* 1997; 51:302–307.

Sachdev HPS, Krishna J, Puri RK, Singh KK, Satyanarayana L, Kumar S. Water supplementation in exclusively breastfed infants during summer in the tropics. *Lancet* 1991; 337:929–33.

Scrimshaw NS. Iron deficiency. *Scientific American* 1991; October 46–52.

Shrago L, Bocar D. The infant's contribution to breastfeeding. *JOGN Nursing* 1990; May-June:209–15.

Shetty PS, James WPT. Body mass index: A measure of chronic energy deficiency in adults. FAO Food and Nutrition Paper 56. Rome: Food and Agriculture Organization, 1994.

Siega-Riz AM, Adair LS. Biological determinants of pregnancy weight gain in a Filipino population. *American Journal of Clinical Nutrition* 1993; 57:365–72.

Sloan N, Jordan EA, Winikoff B. Does iron supplementation make a difference? Working Paper 15. Arlington, VA: MotherCare, 1992.

Sommer A, West KP. Vitamin A deficiency: Health, survival, and vision. New York: Oxford University Press, 1996.

Stoltzfus RJ, Dreyfuss ML. Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia. Prepared for the International Nutritional Anemia Consultative Group. 1998.

Stoltzfus RJ. Iron deficiency and strategies for its control. Report prepared for the Office of Nutrition. USAID, 1995.

Stoltzfus RJ, Dreyfuss M, Shrestha JB, Khatry SK, Schulze K, West KP. Effect of maternal vitamin A or B-carotene supplementation on iron-deficiency anemia in Nepalese pregnant women, post-partum mothers, and infants. Presentation at IVACG, Cairo, 1997.

Suharno et al. Supplementation with vitamin A and iron for nutritional anaemia in pregnant women in West Java, Indonesia. *Lancet* 1993; 342:1325–28.

Tafari N, Naeye RL, Gobezie A. Effects of maternal undernutrition and heavy physical work during pregnancy on birthweight. *British Journal of Obstetrics and Gynaecology* 1980; 87:222–26.

Underwood BA. Weaning practices in deprived environments: The weaning dilemma. In: Feeding the normal infant. Supplement to *Pediatrics*. American Academy of Pediatrics, 1985.

UNICEF. State of the World's Children 1998. New York: UNICEF, 1998.

UNICEF/WHO Joint Committee on Health Policy (1995). Strategic approach to operationalizing selected end-decade goals: reduction of iron deficiency anemia, JCHP 30/95/4.5 as reported by Brown et al., 1997.

UNICEF. The progress of nations. New York: UNICEF, 1994, 1995, 1997.

UNICEF. Food, health and care: The UNICEF vision and strategy for a world free from hunger and malnutrition. New York: UNICEF, 1992.

U.S. Department of Agriculture. Composition of foods...Raw, processed, prepared. USDA Nutrient database for standard reference. Release No. 12. Nutrient Data Laboratory Home Page, http://www.nal.usda.gov/fnic/foodcomp, (1998).

VanLandingham M, Trussell J, Grummer-Strawn L. Contraceptive and health benefits of breastfeeding: A review of the recent evidence. *International Family Planning Perspectives* 1991; 17(4):131–36.

Victora CG, Tomasi E, Olinto MTA, Barros FC. Use of pacifiers and breastfeeding duration. *Lancet* 1993; 341:404–406.

West K, Khatry SK, Katz J, LeClerq SC, Pradhan EK et al. Impact of weekly supplementation of women with vitamin A or beta-carotene on fetal, infant and maternal mortality in Nepal. Presentation at IVACG, Cairo, 1997.

Winkvist A, Rasmussen KM, Habicht J-P. A new definition of maternal depletion syndrome. *American Journal of Public Health* 1992; 82:691–94.

Wollinka O, Burkhalter B, Bashir N, eds. Hearth nutrition model: Applications in Haiti, Vietnam, and Bangladesh. Arlington, VA: BASICS Project, 1997.

World Bank. Enriching lives: Overcoming vitamin and mineral malnutrition in developing countries. Washington, DC:World Bank, 1994.

World Bank. World Development Report 1993: Investing in health. New York: Oxford University Press, 1993.

World Health Organization. Vitamin A supplements dosage. Nut/97.1. WHO, 1997.

World Health Organization/Micronutrient Initiative. Safe vitamin A dosage during pregnancy and lactation. Recommendations and report of a consultation. Preliminary version. WHO, 1997.

World Health Organization. Basic principles for the preparation of safe food for infants and young children. Geneva: WHO Food Safety Unit. June, 1996.

World Health Organization. Maternal anthropometry and pregnancy outcomes: A WHO collaborative study. *Bulletin of the World Health Organization* 1995; 72 (Supplement):xi–98.

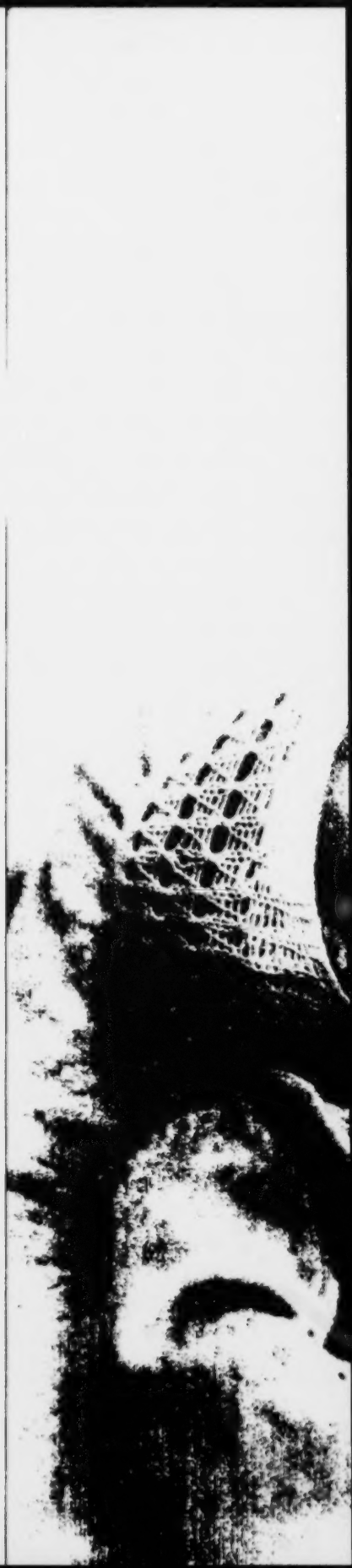
World Health Organization. Report of the WHO informal consultation on hookworm infection and anaemia in girls and women. Geneva, 5–7 December, 1994.

World Health Organization. Contaminated food: a major cause of diarrhoea and associated malnutrition among infants and young children. Facts about Infant Feeding. Geneva, April 1993.

World Health Organization. Low birth weight: A tabulation of available information. Geneva: WHO, 1992.

World Health Organization. Breast-feeding and the use of water and teas. *CDD Update*. No 9, August 1991.

Zavaleta et al. Serum zinc concentrations in pregnant Peruvian women receiving prenatal iron and zinc supplements. FASEB. Abstract No. 3774. New Orleans, 1997.



AED

Academy for Educational Development

USAID

cover photo by Inter American Development Bank

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

[X] This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

[ ] This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").